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PROCEEDINGS

OF THE

Washington Academy of Sciences

VOL. IV

1902

WASHINGTON
MARCH-OCTOBER 1902

AFFILIATED SOCIETIES

ANTHROPOLOGICAL SOCIETY OF WASHINGTON
BIOLOGICAL SOCIETY OF WASHINGTON
CHEMICAL SOCIETY OF WASHINGTON
COLUMBIA HISTORICAL SOCIETY
ENTOMOLOGICAL SOCIETY OF WASHINGTON
GEOLOGICAL SOCIETY OF WASHINGTON
MEDICAL SOCIETY OF THE DISTRICT OF COLUMBIA
NATIONAL GEOGRAPHIC SOCIETY
PHILOSOPHICAL SOCIETY OF WASHINGTON

3672

CONTENTS.

| | PAGE. |
|--|-------|
| Organization and Membership of the Washington Academy of Sciences. | I |
| Hopkins Stanford Galapagos Expedition.—VII. Arachnida ; by Nathan Banks | 49 |
| Harriman Alaska Expedition.—XXVII. Apterygota ; by J. W. Folsom | 87 |
| Harriman Alaska Expedition.—XXVIII. Hymenoptera ; by W. H. Ashmead | 117 |
| Hopkins Stanford Galapagos Expedition.—VIII. Brachyura and Macrura ; by Mary J. Rathbun | 275 |
| Harriman Alaska Expedition.—XXIX. The Mosses of Alaska ; by J. Cardot and I. Thériot | 293 |
| Harriman Alaska Expedition.—XXX. Anemones with discussion of variation in Metridium ; by H. B. Torrey | 373 |
| Hopkins Stanford Galapagos Expedition.—IX. Shistocerca, Sphingonotus and Halmenus ; by R. E. Snodgrass | 411 |
| Hopkins Stanford Galapagos Exposition.—X. Mallophaga from Birds ; by Vernon L. Kellogg and Shinkai I. Kuwana | 457 |
| Hopkins Stanford Galapagos Expedition.—XI. The Birds of Clipperton and Cocos Islands ; by R. E. Snodgrass and E. Heller | 501 |
| Hopkins Stanford Galapagos Expedition.—XII. Echinodermata , by Hubert Lyman Clark | 521 |
| The Eyes of Rhineura Floridana ; by Carl H. Eigenmann | 533 |
| Hopkins Stanford Galapagos Expedition.—XIII. Marine Mollusca ; by H. A. Pilsbry and E. G. Vanatta | 549 |
| Index | 561 |

ILLUSTRATIONS.

PLATES.

| | FACING PAGE. |
|---|--------------|
| I-III. Galapagos Arachnida..... | 82 |
| IV-VIII. Alaska Apterygota..... | 108 |
| IX-XI. Alaska Hymenoptera..... | 264 |
| XII. Galapagos Brachyura..... | 292 |
| XIII-XXIII. Alaska Mosses... | 348 |
| XXIV-XXV. Alaska Anemones..... | 408 |
| XXVI. Map of the Galapagos Islands, showing relationships of <i>Shistocerca</i> | 452 |
| XXVII. Varieties of <i>Shistocerca</i> in the Galapagos..... | 454 |
| XXVIII-XXXI. Galapagos Mallophaga..... | 492 |
| XXXII-XXXIV. Eyes of <i>Rhineura Floridana</i> | 544 |
| XXXV. Marine Mollusca of the Galapagos..... | 560 |

TEXT FIGURES.

| | PAGE. | | PAGE. |
|--|-------|--|-------|
| 1. <i>Discias serrifer</i> , mandible..... | 289 | 13. <i>Edwardsiella sipunculoides</i> , arrangement of mesenteries..... | 382 |
| 2. <i>Discias serrifer</i> , outer maxilliped..... | 290 | 14. <i>Edwardsiella sipunculoides</i> , section..... | 382 |
| 3. <i>Discias serrifer</i> , chela of pereopod..... | 290 | 15. Possible relationship of the species of <i>Edwardsia</i> and Hexactiniæ..... | 383 |
| 4. <i>Discias serrifer</i> , tail fan | 291 | 16. <i>Harenactis attenuata</i> , arrangement of mesenteries | 385 |
| 5. <i>Edwardsia</i> , type..... | 376 | 17. <i>Harenactis attenuata</i> , section | 386 |
| 6. <i>Edwardsia</i> , arrangement of mesenteries..... | 376 | 18. <i>Charisea saxicola</i> , section..... | 389 |
| 7. <i>Edwardsiella</i> , type..... | 377 | 19. <i>Charisea saxicola</i> , mesenteries..... | 389 |
| 8. <i>Edwardsiella sipunculoides</i> , portion of body wall..... | 379 | 20. <i>Epiactis prolifera</i> , section..... | 392 |
| 9. <i>Edwardsiella sipunculoides</i> , section..... | 380 | 21. <i>Epiactis ritteri</i> , section | 393 |
| 10. <i>Edwardsiella sipunculoides</i> , section..... | 380 | 22. <i>Rhineura floridana</i> , side view of head..... | 536 |
| 11. <i>Edwardsiella sipunculoides</i> , section... .. | 381 | | |
| 12. <i>Edwardsiella sipunculoides</i> , rudimentary mesenteries..... | 381 | | |

PROCEEDINGS
OF THE
WASHINGTON ACADEMY OF SCIENCES

VOL. IV, PP. 1-47.

MARCH 22, 1902.

ORGANIZATION AND MEMBERSHIP OF THE
WASHINGTON ACADEMY OF
SCIENCES, 1902.

CONTENTS.

| | PAGE. |
|--|-------|
| Introduction | 2 |
| Act of Incorporation..... | 3 |
| By-Laws..... | 5 |
| Affiliated Societies | 8 |
| Rules Respecting Publication..... | 9 |
| Abstract of Proceedings, 1901..... | 10 |
| Second Annual Report of the Secretary, 1900..... | 11 |
| Third " " " " " 1901..... | 12 |
| Fourth " " " " " 1902..... | 14 |
| First " " " " Treasurer, 1899 | 16 |
| Second " " " " " 1900..... | 18 |
| Third " " " " " 1901..... | 19 |
| Fourth " " " " " 1902..... | 20 |
| Officers and Committees.....1901..... | 22 |
| Officers and Committees.....1902..... | 24 |
| List of Members | 26 |

INTRODUCTION.

In this brochure has been collected material relating to the organization and present membership of the Academy. It includes the Act of Incorporation, the By-Laws, and Rules respecting Publication as now in force, with lists of officers and committees for 1901 and 1902. All reports of the Secretary and Treasurer, not previously published, are also included. These reports show the activities, growth and work of the Academy.

The list of members contains information not found in lists previously printed. It was compiled by the editor, in part from data furnished by the members themselves, and in part by compilation, chiefly from *Who's Who in America*, 1901-1902. Circulars asking for the data needful for making the list were mailed to all members of the Academy, about 300 in all, and returns were received from about 70 per cent. of the members. Errors and omissions were therefore inevitable. With a view to their correction in a future edition, members are invited to submit corrections and additions.

ACT OF INCORPORATION OF WASHINGTON ACADEMY OF SCIENCES.

We, the undersigned, persons of full age and citizens of the United States, and a majority being citizens of the District of Columbia, pursuant to and in conformity with sections 545 to 552, inclusive, of the Revised Statutes of the United States relating to the District of Columbia, as amended by an Act of Congress entitled "An act to amend the Revised Statutes of the United States relating to the District of Columbia and for other purposes," approved April 23, 1884, hereby associate ourselves together as a society or body corporate and certify in writing:

1. That the name of the society is the WASHINGTON ACADEMY OF SCIENCES.

2. That the term for which it is organized is nine hundred and ninety-nine years.

3. That its particular business and objects are the promotion of science, with power:

a. To acquire, hold, and convey real estate and other property and to establish general and special funds.

b. To hold meetings.

c. To publish and distribute documents.

d. To conduct lectures.

e. To conduct, endow, or assist investigation in any department of science.

f. To acquire and maintain a library.

g. And, in general, to transact any business pertinent to an academy of sciences.

4. That the affairs, funds, and property of the corporation shall be in general charge of a Board of Managers, the number of whose members for the first year shall be nineteen, all of whom shall be chosen from among the members of the Academy.

Witness our hands and seals this 18 day of February, 1898:

| | | | |
|-----------------|--------|--------------------|--------|
| J. R. EASTMAN | [SEAL] | GEO. M. STERNBERG | [SEAL] |
| F. W. CLARKE | [SEAL] | H. N. STOKES | [SEAL] |
| G. K. GILBERT | [SEAL] | CHARLES D. WALCOTT | [SEAL] |
| ARNOLD HAGUE | [SEAL] | LESTER F. WARD | [SEAL] |
| L. O. HOWARD | [SEAL] | W J MCGEE | [SEAL] |
| C. HART MERRIAM | [SEAL] | FRANK BAKER | [SEAL] |
| J. W. POWELL | [SEAL] | BERNARD R. GREEN | [SEAL] |

DISTRICT OF COLUMBIA, *to wit*:

I, John D. McChesney, a Notary Public in and for the District aforesaid, do hereby certify that J. R. Eastman, F. W. Clarke, G. K. Gilbert, Arnold Hague, L. O. Howard, C. Hart Merriam, J. W. Powell, Geo. M. Sternberg, H. N. Stokes, Chas. D. Walcott, Lester F. Ward, W J McGee, Frank Baker and Bernard R. Green, parties to a certain Certificate of Incorporation, bearing date on the 18th day of February, 1898, and hereto annexed, personally appeared before me in the District aforesaid, the said J. R. Eastman, F. W. Clarke, G. K. Gilbert, Arnold Hague, L. O. Howard, C. Hart Merriam, J. W. Powell, Geo. M. Sternberg, H. N. Stokes, Chas. D. Walcott, Lester F. Ward, W J McGee, Frank Baker and Bernard Green being personally known to me as the persons who severally made and signed the said certificate and acknowledged the same to be their certificate, act and deed.

Given under my hand and notarial seal, this 18th day of February, 1898.

JNO. D. McCHESNEY,
Notary Public.

[SEAL.]

Endorsed as follows:

9:20 A. M. Received for record February 21, 1898. Recorded in liber 8, fol. 207 *et seq.*, Acts of Incorporation for Dist. of Col.

H. P. CHEATHAM,
Recorder.

BY-LAWS.

(In force January 16, 1902.)

ARTICLE I.—*Members.*

SEC. 1. The Washington Academy of Sciences shall comprise four classes of members, as follows: *Resident members, non-resident members, honorary members* and *patrons*.

SEC. 2. *Resident and non-resident* members shall be persons who by reason of original research or scientific attainment are deemed eligible to these classes; they only shall be entitled to vote. Resident members shall be chosen from the Affiliated Scientific Societies of Washington. The annual dues of resident members shall be ten dollars; of non-resident members, five dollars. Members whose dues are in arrears for more than one year shall be dropped from the roll of the Academy, unless the Board of Managers shall otherwise determine.

SEC. 3. Nominations for membership shall be endorsed by at least three Members of the Academy, who shall present in writing a statement of the qualifications of the nominee, with a list of his more important publications; and such nominations shall be referred to the Board of Managers for consideration.

SEC. 4. *Honorary Members* shall be persons eminent in science, and may be residents of any country. They shall pay no dues.

SEC. 5. Persons who have given to the Academy not less than \$1,000 or its equivalent in property may be elected *Patrons*.

ARTICLE II.—*Officers.*

SEC. 1. The officers of the Academy shall be chosen from the resident members, and shall be a President, one Vice-President from each of the affiliated societies, a Secretary, and a Treasurer, whose terms of office shall be one year, and nine Managers, grouped in three classes of three each, whose terms of office shall be three years. Collectively they shall constitute the Board of Managers.

SEC. 2. The Board of Managers shall transact all business of the Academy not otherwise provided for, and shall have power to fill vacancies in its own membership until the next annual election. Vacancies in the office of Vice-President shall be filled on nomination by the appropriate affiliated societies.

ARTICLE III.—*Meetings.*

SEC. 1. The Annual Meeting shall be held on the third Thursday of January each year. At this meeting the reports of the Secretary, Treasurer, and Auditing Committee shall be presented and officers for the ensuing year shall be elected.

SEC. 2. Other meetings shall be held at such time and place as the Board of Managers may determine.

SEC. 3. Twenty resident members of the Academy shall constitute a quorum for the transaction of business.

ARTICLE IV.—*Committees.*

SEC. 1. The Board of Managers may appoint such standing and special committees as it deems necessary.

SEC. 2. The President shall appoint in advance of the annual meeting an Auditing Committee consisting of three persons, none of whom are officers, to audit the accounts of the Treasurer.

ARTICLE V.—*Elections.*

SEC. 1. At each annual meeting there shall be elected by ballot a President, a Secretary, a Treasurer, and three Managers, who shall serve until the close of the meeting at which their successors are chosen. A majority of the votes cast shall be necessary to elect. Members whose dues are in arrears for one year shall not be entitled to vote or be eligible for any office in the Academy.

SEC. 2. Resident members shall be elected by the members of the Academy, and three-fourths of the votes cast shall be necessary to elect. An election shall be void if the person elected does not within three months thereafter pay his annual dues or satisfactorily explain to the Board of Managers his failure to do so.

SEC. 3. Non-resident members, honorary members, and patrons shall be elected by the Board of Managers, and three-fourths of the votes cast shall be necessary to elect. The Board shall have power to determine and change the status of resident members to non-resident.

ARTICLE VI.—*Coöperation.*

SEC. 1. The Academy may act as a federal head of the Affiliated Scientific Societies of Washington, with power to conduct joint meetings, publish a joint directory and joint notices of meetings, and take action in any matter of common interest to the affiliated societies: *Provided* It shall not have power to incur for or in the name of one or more of these societies any expense or liability not previously authorized by said society or societies.

SEC. 2. The term 'affiliated societies' shall be held to cover the Anthropological, Biological, Chemical, Entomological, National Geographic, Geological, Medical, and Philosophical Societies and such others as may be hereafter added by a majority vote of the members of the Academy, the vote being taken by correspondence.

SEC. 3. One Vice-President may be nominated by each affiliated society from the members of the Academy, subject to election by a majority vote at a meeting of the Academy.

SEC. 4. Any affiliated society may nominate candidates for membership in the Academy.

ARTICLE VII.—*Amendments.*

These By-Laws may be amended in the following manner :

Written notice of proposed change, signed by at least three resident members, may be presented at any meeting of the Academy. Such notice shall be referred to the Board of Managers for consideration and recommendation. The Board of Managers shall consider the proposed change and return it to the Academy for action, with such amendment or recommendation as it deems wise. A two-thirds vote of the members voting shall be necessary to adoption.

AFFILIATED SOCIETIES.

ANTHROPOLOGICAL SOCIETY OF WASHINGTON.

BIOLOGICAL SOCIETY OF WASHINGTON.

CHEMICAL SOCIETY OF WASHINGTON.

COLUMBIA HISTORICAL SOCIETY.

ENTOMOLOGICAL SOCIETY OF WASHINGTON.

GEOLOGICAL SOCIETY OF WASHINGTON.

NATIONAL GEOGRAPHIC SOCIETY.

MEDICAL SOCIETY OF THE DISTRICT OF COLUMBIA.

PHILOSOPHICAL SOCIETY OF WASHINGTON.

RULES RESPECTING PUBLICATION.

1. The PROCEEDINGS OF THE WASHINGTON ACADEMY OF SCIENCES shall be issued in dated brochures, paged consecutively for the volume.

2. A brochure may comprise one or more papers, according to length, at the option of the Committee on Publication.

3. The date on each brochure shall be that of actual publication, which shall be one day later than the date of delivery by the printer to the Committee.

4. Each brochure shall be distributed on the date of its publication. Copies shall be sent to all members of the Academy, to subscribers and to a library and exchange list approved by the Board of Managers.

5. At the close of each volume, which shall coincide as nearly as possible with the calendar year, a brochure comprising the title page, contents and index of the volume shall be issued.

6. The regular edition shall consist of twelve hundred copies.

7. Contributors to the PROCEEDINGS must be members of the Academy, or of one of the Affiliated Societies; provided, however, that in exceptional cases the Board, by a three-fourths vote of the members voting at a stated meeting, may accept for publication papers contributed by non-members of the Affiliated organizations.

8. Each paper offered for publication must be accompanied by a written recommendation from the Affiliated Society representing the branch of Science to which the paper relates, except in special cases where publication is ordered by the Board of Managers of the Academy.

9. In case of papers tendered by an Affiliated Society, the cost of publication shall be shared equally by the Academy and said Society.

10. Papers offered for publication shall be delivered to the Chairman of the Committee on Publication, who shall be Editor of the PROCEEDINGS. The Editor shall submit to the Committee an estimate of cost, and shall see that papers are promptly examined in such manner as the Board of Managers may direct.

11. Manuscript submitted for publication must be in form, as well as in substance, ready for the printer. It must be complete as to text and illustrations, must be perfectly legible (preferably typewritten), and must be preceded by a brief table of contents.

12. The Academy shall not be responsible for the cost of revising manuscripts or illustrations. The cost of proof corrections due to alterations made by the author shall be charged to him.

14. Papers accepted for publication in the Academy's PROCEEDINGS must not be previously published elsewhere except by consent of the Board of Managers of the Academy.

15. Authors' separates shall not differ in any particular from the regular edition. Any desired number may be ordered in advance through the Committee on Publication, at the expense of the author, and at a rate of cost agreed upon by the Committee and the printer.

16. Authors shall receive, free of cost, thirty copies of their papers.

ABSTRACT OF PROCEEDINGS.

1901.

The series of addresses on "The progress and tendency of science during the nineteenth century," begun on December 11, 1900, was continued in 1901 as follows:

January 22.—"The progress and tendency of physics"; by Professor WILLIAM HALLOCK, of Columbia University, New York.

February 19.—"The progress and tendency of mechanical engineering and electricity"; by Professor R. H. THURSTON, of Cornell University, Ithaca, N. Y.

March 19.—"The progress and tendency of astronomy"; by Professor SIMON NEWCOMB.

February 26.—Mr. W J McGee, retiring president of the Anthropological Society delivered, under the auspices of the Academy, the annual address; subject, "Man's place in nature."

April 8.—A memorial meeting was held under the auspices of the Academy in honor of Dr. S. C. BUSEY, one of the vice-presidents of the Academy.

April 17.—Professor ALPHEUS HYATT, of Boston, lectured before the Academy on "A new law of evolution."

SECOND ANNUAL REPORT OF THE SECRETARY, 1900

TO THE WASHINGTON ACADEMY OF SCIENCES:

Gentlemen: In compliance with the By-Laws the secretary has the honor to submit this, the *second* annual report, which covers the period from January 18, 1899, to January 17, 1900.

The Academy held during the year eight meetings, of which four were for the transaction of business and four for the presentation of subjects of scientific interest. At two of the latter receptions were given, one to the National Academy of Sciences, the other to the Geological Society of America.

A carefully prepared plan of publication of the Proceedings of the Academy has been worked out, perfected, adopted and publication begun on the brochure plan. Volume I., for the year 1899, is nearly completed at the date of this report. The edition was 1,000. In addition a small pamphlet containing a list of the officers and members, with the Act of Incorporation, By-Laws, Rules respecting publication, etc., was printed. The Joint Directory (Red Book) of the Academy and its affiliated societies was also published and distributed to members.

The Board of Managers has held 25 meetings, at which the average attendance was 13. It has given much attention to the matter of securing for the use of the Academy and the affiliated societies a building suitable for their needs. To this end Mr. Henry Phipps offered a subscription of \$3,000 on condition that three-fourths of the amount needed should be subscribed by reliable parties before July 1, 1900.

An effort was also made to extend the influence of the Academy by providing for a class of non-resident members. In May, 1900, the Academy so amended the By-laws as to provide for such a class and empowered the Board to elect thereto persons who by reason of original research or scientific attainment should be deemed eligible. Pursuant to such authority the Board created special committees representing different branches of science and upon their recommendations elected to non-resident membership 208 persons, classified as follows: Anthropology, 13; Astronomy, 14; Botany, 10; Chemistry, 20; Geography, 7; Geology, 18; Mathematics, 14; Medicine, 23; Mineralogy, 3; Physics, 11; Statistics, 33; Zoölogy, 42.

During the year Mrs. Gardiner Greene Hubbard, "in accordance with the well-known desires of her deceased husband to favor the ad-

vancement of science and the diffusion of scientific knowledge," presented to the Academy \$1,000 and was elected its first patron.

The membership has somewhat increased during the year as appears from the following statement :

| | | |
|---|-----|-----|
| Resident membership at the last annual meeting... | 144 | |
| Original members allowed by the Board to qualify | 7 | |
| Reinstated by withdrawal of resignations..... | 2 | |
| Elected during the year..... | 16 | 169 |
| Deceased since last annual meeting..... | 2 | |
| Failed to qualify..... | 3 | |
| Resigned..... | 5 | 10 |
| Present resident membership..... | | 159 |
| Patrons..... | | 1 |
| Total membership | | 160 |

Respectfully submitted,
FRANK BAKER,
Secretary.

JANUARY 17, 1900.

THIRD ANNUAL REPORT OF THE SECRETARY, 1901.

TO THE WASHINGTON ACADEMY OF SCIENCES:

Gentlemen: In compliance with the By-Laws the Secretary has the honor to submit this, the *third* annual report which covers the period from January 17, 1900, to January 17, 1901.

The Academy held, during the year, four meetings, of which three were for the transactions of business and one for social purposes, being a reception to the American Institute of Mining Engineers held in the Corcoran Gallery of Art, February 21, 1900. At the business meetings the principal matter considered related to the purchase of a lot and the erection of a building for the use of the Academy and the affiliated societies. It was known that the National Academy of Sciences had decided to coöperate with regard to such a building provided a proper site and accommodations suitable for its purposes could be procured. A favorable opportunity appearing, a building lot on 15th Street near M was purchased, though this site was not regarded as definitely determined upon.

The By-Laws were so amended as to make the third Thursday in January the date of the annual meeting.

The Board of Managers held 25 meetings at which the average attendance was 12. The plans, policy, work and prospects of the Academy were diligently considered and discussed at these meetings. Non-resident members to the number of 99 were elected near the close of the year. The Board has also elected four patrons during the year. They are

Mrs. Henry Lee Higginson, of Boston.

Mr. Gifford Pinchot, of Washington.

Mr. James Wallace Pinchot, of New York.

Mr. Thomas Francis Walsh, of Washington.

By the generosity of these patrons \$4,500 was added to the funds of the Academy.

Volume II. of the PROCEEDINGS (edition 1,200) was printed and a part of the edition distributed to members and to a selected list of exchanges. The Joint Directory (Red Book) of the Academy and the affiliated societies was also printed and distributed to members.

The statistics of membership are as follows:

Patrons.

| | | |
|------------------------------|---|---|
| At date of last report..... | 1 | |
| Elected during the year..... | 4 | 5 |

Resident Members.

| | | |
|--|-----|-----|
| At date of last report..... | 159 | |
| Original members allowed to qualify..... | 1 | |
| Elected during the year..... | 7 | 167 |
| Deceased during the year | 1 | |
| Failed to qualify | 4 | |
| Resigned..... | 3 | |
| Dropped | 1 | |
| Transferred to non-resident class..... | 2 | 11 |
| | | 156 |

Non-resident Members.

| | | |
|--|-----|-----|
| At date of last report..... | 12 | |
| Accepted membership during the year..... | 102 | |
| Transferred from resident class..... | 2 | 116 |
| Resigned..... | | 1 |
| | | 115 |
| Total membership..... | | 276 |

Respectfully submitted,

FRANK BAKER,

Secretary.

JANUARY 17, 1901.

FOURTH ANNUAL REPORT OF THE SECRETARY, 1902.

TO THE WASHINGTON ACADEMY OF SCIENCES.

Gentlemen: In compliance with the By-Laws the Secretary has the honor to submit this, the *fourth* annual report which covers the period from January 17, 1901, to January 16, 1902.

Six meetings of the Academy were held during the year, one a memorial meeting to Dr. Samuel Claggett Busey, who died February 12, 1901, and the others to listen to addresses before or under the auspices of the Academy. (For list of these see page 10.)

Volume III. of the PROCEEDINGS (edition 1,200) was printed and a part of the edition distributed to members and to a selected list of exchanges. The Joint Directory (Red Book) of the Academy and the affiliated societies was also printed and distributed to members. The cost of publication exceeded \$3,000, a considerable part of which was defrayed by subscriptions of private parties.

The Board of Managers has held 18 meetings, at which the average attendance was 13. Its work was mainly directed toward securing a permanent home for the Academy and the affiliated societies, and in perfecting plans and providing ways and means for promoting scientific post-graduate work in the city of Washington.

The Board of Regents of the Smithsonian Institution having passed a resolution favoring action by Congress with regard to affording facilities for post-graduate study and research, the Board of the Academy expressed its gratification at this action.

Influenced, doubtless, by this action of the Regents, the following legislation was made by Congress, act of March 3, 1901.

“That facilities for study and research in the Government Departments, the Library of Congress, the National Museum, the Zoölogical Park, the Bureau of Ethnology, the Fish Commission, the Botanic Gardens, and similar institutions hereafter established shall be afforded to scientific investigators and to duly qualified individuals, students, and graduates of institutions of learning in the several States and Territories, as well as in the District of Columbia, under such rules and restrictions as the heads of the Departments and Bureaus mentioned may prescribe.”

It being known that the George Washington Memorial Association had amended its charter and appointed a committee of conference with reference to the erection of a building, the Board appointed a

similar committee. A number of conferences were held and the following resolutions were finally passed by the George Washington Memorial Association and the Board of the Academy.

Resolved, That the Washington Academy of Sciences coöperate with the George Washington Memorial Association to found in the city of Washington an institution to be known as the Washington Memorial Institution; and be it further

Resolved, That in such coöperation the George Washington Memorial Association undertake to secure a suitable site and erect thereon a substantial, dignified building sacred to the memory of George Washington; and that the Washington Academy of Sciences undertake to provide for the maintenance and conduct of the Institution in the interest of science and literature; and there may be joined with it in this work the National Educational Association, and the Association of Agricultural Colleges and Experiment Stations.

Resolved, That when the Washington Memorial Institution is incorporated, its conduct and maintenance shall pass into the control of the Board of Trustees of said institution.

Resolved, That the management, control and policy of the Institution be vested in a Board of Trustees, consisting of the Chief Justice of the Supreme Court, Vice-President of the United States, Secretary of State, Secretary of the Treasury, Secretary of the Interior and Secretary of Agriculture, as trustees *ex-officio*, and twelve other persons whose term of office shall be three years; their selection the first year to be made by the incorporators of the said Washington Memorial Institution; said Board of Trustees shall have power to fill vacancies and to elect four trustees annually. The incorporators shall be selected by the committees now representing the Board of Trustees of the George Washington Memorial Association and of the Washington Academy of Sciences.

The Washington Memorial Institution was incorporated May 16, 1901, and on May 27 elected the following Board of Trustees:

| | |
|-----------------------------|-------------------------|
| Dr. Edwin A. Alderman, | Mrs. Phebe A. Hearst, |
| Prof. A. Graham Bell, | Mrs. Archibald Hopkins, |
| Dr. Nicholas Murray Butler, | Dr. C. Hart Merriam, |
| Dr. C. W. Dabney, | Dr. Cyrus Northrop, |
| Dr. D. C. Gilman, | Dr. H. S. Pritchett, |
| Dr. A. T. Hadley, | Dr. Geo. M. Sternberg, |
| Dr. William R. Harper, | Hon. Chas. D. Walcott, |
| | Hon. Carroll D. Wright. |

At a meeting held June 3, 1901, Mr. Walcott was elected President of the Institution; Dr. Gilman, Director; Dr. Butler, Secretary, and C. J. Bell, Treasurer.

The statistics of membership are as follows:

Patrons.

| | | |
|------------------------------|---|---|
| At date of last report..... | 5 | |
| Elected during the year..... | 3 | 8 |

Resident Members.

| | | | |
|--|-----|-----|-----|
| At date of last report..... | 156 | | |
| Elected during the year..... | 2 | 158 | |
| Deceased..... | 3 | | |
| Resigned..... | 6 | | |
| Transferred to non-resident class..... | 1 | 10 | 148 |

Non-resident Members.

| | | | |
|--------------------------------------|-----|-----|-----|
| At date of last report..... | 115 | | |
| Elected during the year..... | 51 | | |
| Transferred from resident class..... | 1 | 167 | |
| Resigned..... | 11 | | |
| Deceased..... | 4 | 15 | 152 |
| Total membership..... | | | 308 |

Respectfully submitted,

FRANK BAKER,

Secretary.

JANUARY 16, 1902.

FIRST ANNUAL REPORT OF THE TREASURER, 1899.

TO THE WASHINGTON ACADEMY OF SCIENCES:

Gentlemen: In compliance with the By-Laws, the Treasurer has the honor to submit this, his *first* annual report, which covers the period from the organization of the Academy, February 18, 1898, to January 12, 1899:

| | |
|---------------------------|------------|
| Total receipts..... | \$1,474.83 |
| Total disbursements | 446.53 |
| Balance on hand | \$1,028.30 |

The *receipts* were:

| | |
|-------------------------------------|------------|
| From annual dues | \$1,460.00 |
| From interest on bank deposits | 14.83 |
| Total | \$1,474.83 |

The *disbursements* were :

| | |
|---|------------|
| Organization | \$56.81 |
| Publications..... | 49.00 |
| Lectures | 5.25 |
| Announcements..... | 55.41 |
| Annual addresses of presidents of affiliated societies | 132.58 |
| Secretary's office | 93.93 |
| Treasurer's office..... | 53.55 |
| Total | \$446.53 |
| Balance on hand, deposited with the Amer- ican Security and Trust Co. | \$1,028.30 |

Respectfully submitted,
BERNARD D. GREEN,
Treasurer.

JANUARY 12, 1899.

REPORT OF AUDITING COMMITTEE, 1899.

TO THE WASHINGTON ACADEMY OF SCIENCES :

Gentlemen : Your committee appointed to audit the accounts of the Treasurer beg to report :

We have examined the *receipts* and find that 146 persons qualified as members of the Academy by paying ten dollars each. The only other receipt was an item of interest on the deposit reported by the American Security and Trust Co., and the total receipts reported by the Treasurer are correct.

We have examined all vouchers for *disbursements* and find all of them approved by the President and Secretary, properly receipted and the sum agrees with the sum reported by the Treasurer.

We have examined the Treasurer's bank book and find the balance reported by the American Security and Trust Co., correct and in agreement with amount reported by the Treasurer.

Your committee in conclusion beg to heartily commend the method adopted by the Treasurer in keeping the accounts of the Academy.

Respectfully submitted,

J. S. DILLER,
H. M. PAUL,
C. K. WEAD,
Auditing Committee.

JANUARY 12, 1899.

Proc. Wash. Acad. Sci., March, 1902.

SECOND ANNUAL REPORT OF THE TREASURER, 1900.

TO THE WASHINGTON ACADEMY OF SCIENCES:

Gentlemen: In compliance with the By-Laws the Treasurer has the honor to submit this, his *second* annual report, which covers the period from January 12, 1899, to January 10, 1900:

| | |
|---|-----------------|
| Balance from last report..... | \$1,028.30 |
| Received since | <u>2,569.12</u> |
| Total,..... | 3,597.42 |
| Disbursed since (including investment)..... | <u>2,188.21</u> |
| Balance on hand..... | \$1,409.21 |

The *receipts* were:

| | |
|------------------------------------|--------------|
| From annual dues..... | \$1,410.00 |
| Donation from one patron..... | 1,000.00 |
| Sales of publications..... | 98.68 |
| Interest on deposit and investment | <u>60.44</u> |
| Total | \$2,569.12 |

The *disbursements* were:

| | |
|---|--------------|
| Investment of one patron's donation..... | \$1,000.00 |
| Publication of Proceedings Vol. I. | 254.55 |
| Publication of Joint Directory..... | 265.41 |
| Receptions..... | 318.25 |
| Presidential addresses..... | 174.65 |
| Saturday lectures and sundry addresses..... | 82.80 |
| Rent of Cosmos Club hall..... | 27.00 |
| Secretary's office..... | 53.85 |
| Treasurer's office..... | <u>11.70</u> |
| Total,..... | \$2,188.21 |
| Balance on hand, deposited with the American Security and Trust Co., and drawing 2% interest... | \$1,409.21 |

The patron's donation is invested in a real estate mortgage at 6%.

Outstanding bills received too late for payment before closing the books amount to \$218.69, leaving an available balance so far as the Treasurer is advised of \$1,190.52.

Respectfully submitted,
 BERNARD R. GREEN,
Treasurer.

JANUARY 17, 1900.

THIRD ANNUAL REPORT OF THE TREASURER, 1901.

TO THE WASHINGTON ACADEMY OF SCIENCES:

Gentleman: In compliance with the By-Laws the Treasurer has the honor to submit this, his *third* annual report, which covers the period from January 10, 1900, to January 7, 1901.

| | |
|--------------------------------|------------------|
| Balance from last report | \$ 1,409.21 |
| Received since | <u>11,516.06</u> |
| Total | \$12,925.27 |
| Disbursed since | <u>10,788.18</u> |
| Balance on hand..... | \$ 2,137.09 |

The *receipts* were:

| | |
|--|-----------------|
| From annual dues..... | \$ 1,945.07 |
| From four patrons..... | 4,500.00 |
| From sales of publications..... | 44.08 |
| From interest on deposits and investments..... | 126.91 |
| From sale of two notes..... | 2,000.00 |
| Borrowed | <u>2,900.00</u> |
| Total | \$11,516.06 |

The *disbursements* were:

| | |
|--|--------------|
| Investment of one patron's donation..... | \$ 1,000.00 |
| Purchase of building lot on 15th Street..... | 6,896.95 |
| Publication of PROC's, Vol. I..... | 907.64 |
| Publication of PROC's, Vol. II..... | 568.23 |
| Publication of Joint Directory..... | 237.90 |
| Receptions..... | 433.95 |
| Presidential addresses | 74.55 |
| Lectures..... | 431.85 |
| Rent of Cosmos Club hall..... | 9.00 |
| Secretary's office..... | 178.83 |
| Treasurer's office | <u>49.28</u> |
| Total | \$10,788.18 |

Balance on hand, deposited with the
American Security and Trust
Co. and drawing 2 % interest...

\$2,137.09

The patron's donation is invested in a real estate note drawing 5 per cent. interest.

The building lot was purchased in December, 1900, at a total cost of \$6,896.95. It is located on the east side of 15th street, N. W., south of M street, is 57 feet wide by 116.6 feet deep and contains 6,646.2 square feet.

Outstanding bills received too late for payment before closing the books amount to \$175.41 leaving an available balance, so far as the Treasurer is advised, of \$1,961.68.

Respectfully submitted,

BERNARD R. GREEN,

Treasurer.

JANUARY 7, 1901.

FOURTH ANNUAL REPORT OF THE TREASURER, 1902.

TO THE WASHINGTON ACADEMY OF SCIENCES:

Gentlemen: In compliance with the By-Laws, the Treasurer has the honor to submit this, his *fourth* annual report, which covers the period from January 7, 1901, to January 11, 1902.

| | |
|--------------------------------|-------------|
| Balance from last report | \$ 2,137.09 |
| Received since | 16,625.20 |
| Total | 18,762.29 |
| Disbursed since..... | 12,036.61 |
| Balance on hand..... | 6,725.68 |

The *receipts* were:

| | |
|--|-------------|
| From annual dues..... | \$ 2,340.00 |
| From two patrons..... | 2,000.00 |
| From sales of publications | 169.44 |
| From sale of lot on 15th street.. | 9,506.24 |
| From payment of note..... | 2,500.00 |
| From interest on deposits and investments | 109.52 |
| Total. | 16,625.20 |

The *disbursements* were :

| | |
|---|-----------|
| Investments | 7,828.21 |
| Publication of Proceedings, Vol. II.... | 1,783.76 |
| Publication of Proceedings, Vol. III... | 1,655.72 |
| Publication of Joint Directory..... | 272.96 |
| Receptions | 20.80 |
| Presidential addresses..... | 32.50 |
| Lectures..... | 272.76 |
| Rent of Cosmos Club hall..... | 6.00 |
| Secretary's Office | 84.00 |
| Treasurer's Office..... | 79.90 |
| Total..... | 12,036.61 |

Of the balance, \$6,710.65 is on deposit with the American Security and Trust Co., drawing 2 per cent. interest, and the remainder, \$15.03, is cash in the hands of the Treasurer. There are no outstanding bills, so far as the Treasurer is advised.

The *assets* of the Academy consist of a real estate mortgage note of \$4,500, at 4½ per cent., dated June 11, 1901, on the 15th street lot, of which \$2,500 has been paid, leaving the present value

| | |
|-------------------|------------|
| | \$2,000.00 |
| Cash on hand..... | 6,725.68 |
| Total | \$8,725.68 |

In these assets are included all sums unconditionally contributed by patrons and the accretions thereto from investments, as follows :

| | |
|--|------------|
| Original contributions..... | \$6,000.00 |
| Profit on sale of building lot..... | 2,273.45 |
| Interest on two notes, sold | 49.09 |
| Interest on bank deposits (estimated)..... | 25.00 |
| | <hr/> |
| | 8,347.54 |
| | <hr/> |
| | \$378.14 |

Under the rule that patrons' donations and their accumulations from investments are set aside as a permanent fund, this balance (\$378.14) is the amount now available for general expenses.

Respectfully submitted,

BERNARD R. GREEN,

Treasurer.

JANUARY 11, 1902.

WASHINGTON ACADEMY OF SCIENCES

OFFICERS ELECTED JANUARY 17, 1901

President

CHARLES D. WALCOTT

Vice-Presidents

| | |
|---|---------------------------|
| <i>From the Anthropological Society</i> | W. H. HOLMES |
| <i>Biological Society</i> | F. A. LUCAS |
| <i>Chemical Society</i> | V. K. CHESNUT |
| <i>Columbia Historical Society</i> | J. A. KASSON ¹ |
| <i>Entomological Society</i> | H. G. DYAR |
| <i>Geological Society</i> | G. K. GILBERT |
| <i>Medical Society</i> | S. C. BUSEY ² |
| <i>National Geographic Society</i> | A. GRAHAM BELL |
| <i>Philosophical Society</i> | J. HOWARD GORE |

Secretary

FRANK BAKER

Treasurer

BERNARD R. GREEN

Managers

| <i>Class of 1902</i> | <i>Class of 1903</i> | <i>Class of 1904</i> |
|----------------------|----------------------|----------------------|
| L. O. HOWARD | F. W. CLARKE | MARCUS BAKER |
| J. W. POWELL | WHITMAN CROSS | GEORGE M. KOBER |
| CARROLL D. WRIGHT | C. HART MERRIAM | GEORGE M. STERNBERG |

Standing Committees—1901*Committee on Rules*

CARROLL D. WRIGHT
 RICHARD RATHBUN
 F. V. COVILLE

Committee on Functions

F. W. CLARKE
 C. L. MARLATT
 L. A. BAUER

Committee on Publication

MARCUS BAKER
 C. HART MERRIAM
 JOHN HYDE
 O. H. TITTMANN
 BAILEY WILLIS

Committee on Lectures

GEO. M. KOBER
 W J MCGEE
 G. M. STERNBERG
 WILLIS L. MOORE
 H. W. WILEY
 W. H. HOLMES

¹ Resigned January 30, 1901, and succeeded by W J McGee.² Died February 12, 1901, and succeeded by W. W. Johnston.

Committee on Building

| | |
|------------------|-------------------|
| S. C. BUSEY | GEORGE M. KOBER |
| A. GRAHAM BELL | S. P. LANGLEY |
| E. M. GALLAUDET | H. M. PAUL |
| THEODORE GILL | GIFFORD PINCHOT |
| BERNARD R. GREEN | GEO. M. STERNBERG |
| ARNOLD HAGUE | H. W. WILEY |
| JOHN M. WILSON | |

Committee on Finance

| | |
|---------------|---------------|
| WHITMAN CROSS | B. R. GREEN |
| L. O. HOWARD | W. H. ASHMEAD |
| F. W. HODGE | |

*Special Committees—1901**Committees on Non-resident Membership*

- Anthropology*: W. H. Holmes, W J McGee, Alice Fletcher.
Botany: F. V. Coville, Gifford Pinchot, E. L. Greene.
Chemistry: F. W. Glarke, H. W. Wiley, C. E. Munroe.
Geography: G. W. Littlehales, H. M. Wilson, W. L. Moore.
Geology: G. K. Gilbert, G. P. Merrill, Bailey Willis.
History: A. R. Spofford, J. A. Kasson, E. M. Gallaudet.
Medicine: S. C. Busey, W. W. Johnston, Geo. M. Kober.
Phys. and Math.: O. H. Tittmann, T. J. J. See, F. H. Bigelow.
Statistics: Carroll D. Wright, John Hyde, Henry Gannett.
Zoölogy: C. Hart Merriam, Richard Rathbun, L. O. Howard.

To confer with the George Washington Memorial Association

| | |
|-------------------|-----------------|
| CHAS. D. WALCOTT | C. HART MERRIAM |
| CARROLL D. WRIGHT | MARCUS BAKER |

WASHINGTON ACADEMY OF SCIENCES

OFFICERS ELECTED JANUARY 16, 1902

President

CHARLES D. WALCOTT

Vice-Presidents

From the Anthropological Society.....W. H. HOLMES
Biological Society.....F. A. LUCAS
Chemical Society.....C. E. MUNROE
Columbia Historical Society.....W. J. MCGEE
Entomological Society.....H. G. DYAR
Geological Society.....G. K. GILBERT
Medical Society.....W. W. JOHNSTON
National Geographic Society.....A. GRAHAM BELL
Philosophical Society.....RICHARD RATHBUN

Secretary

FRANK BAKER

Treasurer

BERNARD R. GREEN

Managers

| <i>Class of 1903</i> | <i>Class of 1904</i> | <i>Class of 1905</i> |
|----------------------|----------------------|----------------------|
| F. W. CLARKE | MARCUS BAKER | L. O. HOWARD |
| C. HART MERRIAM | GEO. M. KOBER | O. H. TITTMANN |
| WHITMAN CROSS | G. M. STERNBERG | CARROLL D. WRIGHT |

*Standing Committees—1902**Committee on Rules*

CARROLL D. WRIGHT
 FREDERICK V. COVILLE
 WILLIS L. MOORE

Committee on Functions

RICHARD RATHBUN
 F. W. CLARKE
 B. T. GALLOWAY

Committee on Publication

MARCUS BAKER
 C. HART MERRIAM
 O. H. TITTMANN
 BAILEY WILLIS
 W. H. ASHMEAD

Committee on Lectures

C. E. MUNROE
 CLEVELAND ABBE
 L. A. BAUER
 A. K. FISHER
 O. F. COOK
 N. H. DARTON

Committee on Building

GEORGE M. KOBER
BERNARD R. GREEN
E. M. GALLAUDET
W J MCGEE
H. M. PAUL

Committee on Finance

GEORGE M. STERNBERG
BERNARD R. GREEN
L. O. HOWARD
J. HOWARD GORE
D. S. LAMB

Committee on Membership

F. W. CLARKE
F. V. COVILLE
HENRY GANNETT
GEORGE M. KOBER
W J MCGEE

C. HART MERRIAM
A. R. SPOFFORD
O. H. TITTMANN
BAILEY WILLIS
CARROLL D. WRIGHT

Committee on Relations of Academy to Other Organizations

CHARLES D. WALCOTT
CARROLL D. WRIGHT
C. HART MERRIAM
MARCUS BAKER

MEMBERS OF THE WASHINGTON ACADEMY OF SCIENCES

JANUARY 16, 1902

PATRONS

- Mr. Edward Henry Harriman**, Arden, N. Y.
Mrs. Phebe Apperson Hearst, San Francisco, Calif.
Mrs. Henry Lee Higginson, 191 Commonwealth Ave., Boston, Mass.
Mrs. Gardiner Greene Hubbard, Twin Oaks, Washington, D. C.
Mr. Henry Cleveland Perkins, 1701 Connecticut Ave., Washington, D. C.
Mr. Gifford Pinchot, 1615 Rhode Island Ave., Washington, D. C.
Mr. James Wallace Pinchot, 2 Gramercy Park, New York City.
Mr. Thomas Francis Walsh, 1825 Phelps Place, Washington, D. C.

RESIDENT MEMBERS

- Abbe, Cleveland, A.B., B.S., LL.D.,**
 Member Nat. Acad. Sci. ; Astr. Gesellschaft ; Fellow Roy. Ast. Soc., etc. ; Editor Monthly Weather Review ; Professor of Meteorology, U. S. Weather Bureau, Washington, D. C. *2017 I Street.*
- Acker, George Nicholas, M.D.,**
 Member Am. Med. Ass. ; Am. Pediatric Soc. ; Clinical Professor of Medicine and Diseases of Children, Columbian University, Washington, D. C. *913 Sixteenth Street.*
- Adams, Henry, LL.D.,**
 Author, Washington, D. C. *1603 H Street.*
- Adams, Samuel Shugert, A.M., M.D.,**
 Secretary Am. Pediatric Soc. ; Member Am. Med. Ass., etc. Physician, Washington, D. C. *Dupont Circle.*
- Adler, Cyrus, A.M., Ph.D.,**
 President Am. Jewish Hist. Soc. ; Librarian Smithsonian Institution, Washington, D. C. *1706 S Street.*
- Ashmead, William Harris, A.M.,**
 Fellow Am. Ass. Adv. Sci. ; Member Am. Ent. Soc., etc. ; Assistant Curator U. S. National Museum, Washington, D. C. *1807 Belmont Avenue.*
- Bailey, Vernon,**
 Member Biol. Soc. Wash ; Assistant U. S. Biological Survey, Department of Agriculture, Washington, D. C. *1834 Kalorama Avenue.*
- Baker, Frank, A.M., M.D., Ph.D.,**
 Fellow Am. Ass. Adv. Sci. ; Member Ass. Am. Anats., etc. ; Superintendent Nat. Zoological Park, Washington, D. C. *1728 Columbia Road.*
- Baker, Marcus, A.M., LL.B.,**
 Member Am. Math. Soc. ; Am. Hist. Soc. ; Fellow Am. Ass. Adv. Sci. ; Secretary U. S. Board on Geographic Names ; Editor Proc. Wash. Acad. Sci. ; Assistant Secretary, Carnegie Institution, Washington, D. C. *1905 Sixteenth St.*

- Bauer, Louis Agricola, C.E., A.M., Ph.D.,**
Fellow Am. Ass. Adv. Sci.; Member Permmt. Intern. Com. on Terr. Mag. and Atmos. Elec.; Editor Terr. Mag. and Atmos. Elec.; in charge Magnetic Work U. S. Coast and Geodetic Survey, Washington, D. C. *1925 I Street.*
- Becker, George Ferdinand, A.B., Ph.D.,**
Member Nat. Acad. Sci.; Fellow Am. Ass. Adv. Sci.; Geologist in charge Div. Chem. and Phys. Research, U. S. Geological Survey, Washington, D. C. *2020 R Street.*
- Bell, Alexander Graham, M.D., Ph.D., LL.D.,**
Member Nat. Acad. Sci.; President Am. Ass. to Promote Teaching of Speech to the Deaf; President Nat. Geog. Soc.; Regent Smithsonian Institution, Washington, D. C. *1331 Connecticut Avenue.*
- Bermann, Isidor Samuel Leopold, M.D.,**
Physician, Washington, D. C. *1010 I Street.*
- Bigelow, Frank Hagar, A.M., B.D., §**
Fellow Am. Ass. Adv. Sci.; Member Deutsche Meteorol. Gesellschaft; Professor of Meteorology, U. S. Weather Bureau, Washington, D. C. *1625 Mass. Ave.*
- Bovée, John Wesley, M.D.,**
Physician, Washington, D. C. *1404 H Street.*
- Bryan, Joseph Hammond, M.D.,**
Member Am. Laryngological Ass.; Physician, Washington, D. C. *818 Seventeenth Street.*
- Burnett, Swan Moses, M.D., Ph.D.,**
Member Amer. Ophthal. Soc.; Professor of Ophthalmology and Otology, Georgetown University, Washington, D. C. *916 Farragut Square.*
- Cameron, Frank Kenneth, Ph.D.,**
Chemist, U. S. Department of Agriculture, Washington, D. C. *Cosmos Club.*
- Campbell, Marius Robison,**
Fellow Geol. Soc. Am.; Member Am. Inst. Mining Engs.; Geologist U. S. Geological Survey, Washington, D. C.
- Chesnut, Victor King, B.S.,**
Member Am. Chem. Soc.; Acad. Intern. de Geog. Botanique. Assistant in charge Poisonous Plant Investigations, U. S. Dept. Agric., Washington, D. C. *1335 Wallach Place.*
- Clarke, Frank Wigglesworth, B.S., D.Sc.,**
Fellow Am. Ass. Adv. Sc.; Member Am. Chem. Soc.; Corr. Member Brit. Ass. Adv. Sci.; Edinb. Geol. Soc.; Honorary Curator of Minerals, U. S. Nat. Mus.; Chief Chemist U. S. Geol. Surv., Washington, D. C. *1612 Riggs Place.*
- Cook, George Wythe, LL.D., M.D.,**
Member Med. Soc. Dist. Col.; Physician, Washington, D. C. *3 Thomas Circle.*
- Cook, Orator Fuller,**
Botanist in Charge of Tropical Agriculture, U. S. Department of Agriculture, Washington, D. C. *Lanham, Md.*
- Coquillett, Daniel William,**
Member Ent. Soc. Wash.; Assistant Entomologist U. S. Department of Agriculture, Washington, D. C. *U. S. National Museum.*

Coville, Frederick Vernon, A.B.,

Editor of Contributions from U. S. National Herbarium ; Member Bot. Soc. Am. ;
Fellow Am. Ass. Adv. Sci. ; Curator Nat. Herb. and Chief Botanist. U. S. Department of Agriculture, Washington, D. C. *1836 California Avenue.*

Cross, Whitman, B.S., Ph.D.,

Fellow Geol. Soc. Am. ; Geologist, U. S. Geological Survey, Washington, D. C.
2138 Bancroft Place.

Darton, Nelson Horatio,

Fellow Geol. Soc. Am. ; Am. Ass. Adv. Sci. ; Member Am. Inst. Mining Engs. ;
Geologist, U. S. Geological Survey, Washington, D. C.

Davis, Arthur Powell, B.S.,

Member Am. Soc. Civil Engs. ; Chief Hydrographer Isthmian Canal Commission ;
Hydrographer U. S. Geol. Surv., Washington, D. C. *2212 First Street.*

Day, David Talbot, A.B., Ph.D.,

Editor in chief Eng. and Min. Journ. ; Fellow Geol. Soc. Am. ; Member Am.
Inst. Mining Engs. ; Am. Chem. Soc. ; Chief Dept. Mines and Metallurgy,
Louisiana Purchase Exposition ; Geologist in charge Mining and Min. Resources, U. S. Geological Survey, Washington, D. C.

Diller, Joseph Silas, B.S.,

Fellow Geol. Soc. Am. ; Geologist, U. S. Geological Survey, Washington, D. C.
1454 Staughton Street.

Dyar, Harrison Gray, A.M., Ph.D.,

Member Bost. Soc. Nat. Hist. ; Am. Acad. Polit. and Soc. Sci., etc. ; Custodian
of Lepidoptera, U. S. National Museum, Washington, D. C. *1512 21st Street.**

Eimbeck, William,

Fellow Am. Ass. Adv. Sci. ; Geodesist, U. S. Coast and Geodetic Survey, Washington, D. C. *1106 New York Avenue.*

Emmons, Samuel Franklin, A.M.,

Member Nat. Acad. Sci. ; Fellow Geol. Soc. Am., etc. ; Geologist in charge Division Metal. Deposits, U. S. Geological Survey, Washington, D. C. *1721 H Street.*

Evermann, Barton Warren, A.M., Ph.D.,

Ichthyologist, U. S. Fish Comm., Washington, D. C. *412 T Street.*

Fewkes, Jesse Walter, A.B., Ph.D.,

Member Am. Ass. Adv. Sci. ; Am. Acad. Arts and Sci. ; Gesellschaft für Anthropologie, Berlin, etc. *Forest Glen, Md.*

Fisher, Albert Kenrick, M.D.,

Ornithologist Biological Survey, U. S. Department of Agriculture, Washington, D. C. *925 Westminster St.*

Fletcher, Alice Cunningham,

Fellow Am. Ass. Adv. Sci. ; Member Archeol. Inst. Am., etc. ; Holder of the Thaw Fellowship, Peabody Museum, Harvard University. Washington, D. C. *214 First Street, S. E.*

Fletcher, Robert, M.D.,

Associate Fellow, College of Physicians, Philadelphia ; Editor Index Medicus ;
Lecturer on Medical Jurisprudence, Johns Hopkins University, Baltimore, Md. ;
Principal Assistant Librarian, Surgeon General's Office, Washington, D. C.
The Portland.

Flint, James Milton, M.D.,

Fellow Am. Ass. Adv. Sci. ; Medical Director U. S. Navy, Smithsonian Institution, Washington, D. C. *The Portland.*

Fry, Henry Davidson, M.D.,

Physician, Washington, D. C. *1601 Connecticut Avenue.*

Gallaudet, Edward Miner, A.B., Ph.D., LL.D.,

Member Am. Hist. Soc. ; Am. Social Sci. Ass., etc. ; President of Gallaudet College for the Deaf, Washington, D. C. *Kendall Green.*

Galloway, Beverly Thomas, B.Ag.Sc.,

Fellow Am. Ass. Adv. Sci. ; Chief Bureau of Plant Industry, U. S. Department of Agriculture, Washington, D. C. *Takoma Park, D. C.*

Gannett, Henry, B.S., LL.D.,

Editor Nat. Geog. Mag. ; Associate Editor Bull. Am. Geog. Soc. ; Chairman U. S. Board on Geographic Names ; Geographer of the 12th Census ; Geographer U. S. Geological Survey, Washington, D. C. *1881 Third Street.*

Gilbert, Grove Karl, A.M., LL.D.,

Member Nat. Acad. Sci. ; Fellow Geol. Soc. Am. ; Am. Ass. Adv. Sci., etc. ; Geologist U. S. Geological Survey, Washington, D. C. *1919 Sixteenth St.*

Gill, Theodore Nicholas, A.M., M.D., Ph.D.,

Member Nat. Acad. Sci. ; Fellow Am. Ass. Adv. Sci., etc. ; Honorary Curator, Smithsonian Institution, Washington, D. C. *321 Four and one-half Street.*

Goode, Richard Urquhart,

Member Nat. Geog. Soc. ; Geographer U. S. Geological Survey, Washington, D. C. *1841 Summit Avenue, Lanier Heights.*

Gore, James Howard, B.S., Ph.D.,

Member Imp. Geog. Soc. ; Professor of Mathematics, Columbian University, Washington, D. C. *2210 R Street.*

Graves, Henry Solon, A.M.,

Mem. Soc. Am. Foresters ; American Forestry Ass., etc. ; Director of the Yale School of Forestry, New Haven, Conn. *337 Humphrey Street.*

Green, Bernard Richardson,

Member Am. Soc. Civil Engs. ; Superintendent Congressional Library Building, Washington, D. C. *1738 N Street.*

Greene, Edward Lee, Ph.B., LL.D.,

Editor of Pittonia ; Member Phila. Acad. Sci., Cal. Acad. Sci. ; Professor of Botany, Catholic University of America, Washington, D. C.

Hagen, John George, S.J.,

Director of Georgetown College Observatory, Washington, D. C.

Hague, Arnold, Ph.B., D.Sc.,

Member and Home Secretary Nat. Acad. Sci. ; Fellow Am. Ass. Adv. Sci. ; Geol. Soc. Am. ; Geol. Soc. Lond., etc. ; Geologist U. S. Geological Survey, Washington, D. C. *1724 I Street.*

Harkness, William,

Professor of Mathematics and Rear Admiral U. S. Navy (retired), Washington, D. C. *Cosmos Club.*

Harris, Rollin Arthur, Ph.D.,

Fellow Am. Ass. Adv. Sci. ; U. S. Coast and Geodetic Survey, Washington, D. C. *Forty-ninth and Albany Streets.*

Harris, William Torrey, Ph.D., LL.D.,

Editor Journ. Spec. Phil., 1867-1893; U. S. Commissioner of Education, Bureau of Education., Washington, D. C. *1303 P Street.*

Hayes, Charles Willard, Ph.D.,

Fellow Geol. Soc. Am.; Member Am. Inst. Min. Engrs.; Geologist in charge of Geology, U. S. Geological Survey, Washington, D. C.

Hill, Robert Thomas,

Fellow Am. Ass. Adv. Sci.; Geologist U. S. Geological Survey, Washington, D. C. *1738 Q Street.*

Hodge, Frederick Webb,

Managing Editor Am. Anthropol.; Member Amer. Folk-Lore Soc., etc.; Assistant in charge of Office, Smithsonian Institution, Washington, D. C. *The Savoy.*

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SUMMARY

| | |
|------------------------------|-----|
| Patrons..... | 8 |
| Resident Members..... | 146 |
| Non-Resident Members..... | 152 |
| Total..... | 306 |
| Counted twice..... | 1 |
| Total number of persons..... | 305 |



PROCEEDINGS
OF THE
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VOL. IV., PP. 49-86. [PLATES I-III.] MARCH 27, 1902.

PAPERS FROM THE HOPKINS STANFORD GALA-
PAGOS EXPEDITION, 1898-1899.

VII.

ENTOMOLOGICAL RESULTS (6).

ARACHNIDA.

BY NATHAN BANKS.

WITH FIELD NOTES BY ROBERT E. SNODGRASS.

CONTENTS:

| | |
|--|------|
| Part I, by Nathan Banks: | |
| Extent and Character of the Collection | 50 |
| Affinities of the Fauna | 51 |
| Geographic Distribution | 54 |
| Technical Descriptions: | |
| Araneida | 55 |
| Filistatidæ | 55 |
| Scytodidæ | 55 |
| Pholcidæ | 56 |
| Dysderidæ | 57 |
| Drassidæ | 57 |
| Clubionidæ | 58 |
| Agalenidæ | 58 |
| Dictynidæ | 59 |
| Theridiidæ | 59 |
| Epeiridæ | 60 |
| Thomisiidæ | 62 |
| Sparassidæ | 63 |
| Ctenidæ | 64 |
| Lycosidæ | 64 |
| Attidæ | 66 |
| Arthrogastra | 67 |
| Phrynida | 67 |
| Scorpionida | 68 |
| Pseudoscorpionida | 68 |
| Solpugida | 69 |
| Acarina | 70 |
| Ixodidæ | 70 |
| Tyroglyphidæ | 70 |
| Part II, by R. E. Snodgrass: | |
| Field Notes | 71 |
| Proc. Wash. Acad. Sci., March, 1902. | (49) |

PART I.

EXTENT AND CHARACTER OF THE COLLECTION.

ABOUT six hundred and fifty Arachnids were collected by this expedition, making the collection by far the largest ever brought from the Galapagos Islands. The specimens belong to forty-eight species which fall in the three great groups of Arachnida as follows: Araneida, thirty-nine species; Arthrogastra, six species; Acarina, three species.

The thirty-nine spiders represent fifteen families, of which the Epeiridæ have nine species, the Attidæ five, the Theridiidæ four, the Sparassidæ and Lycosidæ three each, while the other families are represented by but one or two species each.

Twenty-five species are considered new, and are here first described; two are classified only generically; twenty-one are known species, of which four are peculiar to these islands. The collection contains, with two exceptions, specimens of all species ever taken on these islands. The exceptions are *Segestria æquatoria* of Marx's manuscript, and his young *Agalena*.

The first spider known from these islands—*Gasteracantha insulana*—was described by Thorell in 1859. It has been taken by all subsequent collectors. In 1877 Butler published in the Proceedings of the Zoölogical Society of London a list of the species collected by the Petrel expedition. In 1889 Dr. Marx published a list (without descriptions) in the Proceedings of the U. S. National Museum of the species collected by the Albatross expedition. These lists together include not more than thirteen species, though appearing under sixteen names. They are as follows:

| RECORDED BY BUTLER. | RECORDED BY MARX. |
|--|--|
| <i>Androctonus americanus</i> Linn. | <i>Segestria æquatoria</i> sp. nov. |
| <i>Lycosa indomita</i> Nicolet. | <i>Agalena</i> (immature). |
| <i>Theridium carolinum</i> sp. nov. | <i>Loxosceles galapagoensis</i> sp. nov. |
| <i>Lathrodectes apicalis</i> sp. nov. | <i>Filistata oceanica</i> sp. nov. |
| <i>Gasteracantha insulana</i> Thorell. | <i>Lathrodectes apicalis</i> Butler. |
| <i>Epeira cooksonii</i> sp. nov. | <i>Lathrodectes scelio</i> Thorell. |
| <i>Thomisoides ultriiformis</i> sp. nov. | <i>Gasteracantha insulana</i> Thorell. |
| | <i>Epeira cooksonii</i> Butler. |
| | <i>Heteropoda venatoria</i> Linn. |
| | <i>Menemerus galapagoensis</i> sp. nov. |
| | <i>Centruroides luctifer</i> sp. nov. |
| | <i>Vejovis galapagoensis</i> sp. nov. |

Probably all of those recorded by Butler are in this collection. The *Theridium* I consider as a young *Lathrodectes*; the *Lycosa* as one of the three species, but none agree with Nicolet's figure; and the *Androctonus* was probably one of the two scorpions.

Of those recorded by Marx all but two are represented in this collection; the *Segestria* and the *Agalena*. Dr. Marx never published descriptions of the new species mentioned. His *Filis-tata* and *Loxosceles* agree with my species of the same genera; his *Menemerus* is *Plexippus paykulli*; his *Centruroides* is *Centrurus princeps*; his *Vejois* is *Hadruioides lunatus*, and his *Lathrodectes scelio* was probably the young of *L. apicalis*.

Many of the spiders collected by this expedition and not collected by others were taken in December, January, February and March. Other species will doubtless be found in September and October, so that the total Arachnidous fauna of the islands will probably reach one hundred species.

With one important exception all the large groups of Arachnida are represented. There is no Phalangid. The presence of a Solpugid is unexpected, and it must have been a rare accident that stranded one of these animals alive so many miles from the mainland.

AFFINITIES OF THE FAUNA.

As to the affinities of the spider-fauna of these islands, it should be stated that a number of the new species belong to groups which have been but little collected on the mainland, and therefore may yet be found to occur elsewhere. This is illustrated by the fact that one species described by Butler from these islands now turns out to be identical with a species common in Mexico and the southwestern United States.

The affinities of the fauna can best be shown by tabulation. I have arranged them in five groups.

Cosmopolitan.

| | |
|--------------------------------|--------------------------------------|
| <i>Tegenaria derhami</i> | No. of specimens. on shipboard 1. |
|--------------------------------|--------------------------------------|

Common Tropical Species.

| | |
|-----------------------------------|----|
| <i>Argiope argentata</i> | 64 |
| <i>Heteropoda venatoria</i> | 6 |
| <i>Plexippus paykulli</i> | 2 |
| Total..... | 72 |

Known from Western South America.

| | No. of specimens. |
|-----------------------------------|-------------------|
| <i>Argiope argentata</i> | 64 |
| <i>Tmarus stolzmanni</i> | 2 |
| <i>Heteropoda venatoria</i> | 6 |
| <i>Plexippus paykulli</i> | 2 |
| <i>Hadruroides lunatus</i> | 19 |
| Total..... | 93 |

Known from Central America, West Indies, and Colombia.

| | |
|---------------------------------------|-----|
| <i>Dictyna parietalis</i> | 1 |
| <i>Theridium mixtum</i> | 20 |
| <i>Argyrodes jucundus</i> | 10 |
| <i>Argiope argentata</i> | 64 |
| <i>Epeira oaxensis</i> | 109 |
| <i>Epeira labyrinthea</i> | 87 |
| <i>Epeira prompta</i> | 11 |
| <i>Epeira gregalis</i> | 4 |
| <i>Cyclosa caudata</i> | 65 |
| <i>Argyropeira nigriventris</i> | 10 |
| <i>Heteropoda venatoria</i> | 6 |
| <i>Plexippus paykulli</i> | 2 |
| <i>Marptusa californica</i> | 1 |
| <i>Centrurus princeps</i> | 5 |
| Total..... | 395 |

Known only from the Galapagos.

| | |
|---|----|
| <i>Sicaroides ultriformis</i> | 4 |
| <i>Loxosceles longipalpis</i> | 10 |
| <i>Filistata fasciata</i> | 2 |
| <i>Coryssocnemis</i> (two species)..... | 3 |
| <i>Ariadne tarsalis</i> | 5 |
| <i>Pæcilochroa bifasciata</i> | 1 |
| <i>Prosthesima galapagoensis</i> ... | 1 |
| <i>Aysha pacifica</i> | 3 |
| <i>Theridium</i> sp..... | 1 |
| <i>Lathrodectes apicalis</i> | 27 |
| <i>Gasteracantha insulana</i> | 27 |
| <i>Tetragnatha galapagoensis</i> | 22 |
| <i>Misumena inclusa</i> | 2 |
| <i>Olios galapagoensis</i> | 14 |
| <i>Selenops galapagoensis</i> | 6 |
| <i>Odo</i> (two species)..... | 9 |
| <i>Lycosa</i> (three species)..... | 14 |
| <i>Philæus pacificus</i> | 5 |
| <i>Cyrba insularis</i> | 1 |

| | |
|---|-----|
| <i>Admestina insularis</i> | 1 |
| <i>Charinus insularis</i> | 8 |
| <i>Ammotrecha solitaria</i> | 1 |
| <i>Pseudoscorpions</i> (two species)..... | 8 |
| <i>Amblyomma pilosum</i> | 49 |
| <i>Argas transversa</i> | 1 |
| <i>Tyroglyphus</i> sp..... | 3 |
| Total..... | 227 |

It thus appears that, though only fourteen species are common to the Central American region, as against thirty found only in the Galapagos, the Central American species are represented by nearly twice as many specimens. Moreover, some of the species confined to the Galapagos are very closely allied to species from the Central American region. For example, the *Olios galapagoensis* is very close to *O. fasciculatus* from Mexico and the southwestern United States. Excepting *Charinus* (an Asiatic genus), and *Coryssocnemis* (a Brazilian genus), the genera of the Galapagos species are all represented in the Central American region. Again, when we compare the distribution on the Galapagos Islands of the commoner species we find that the species from the Central American region are the most widely distributed, as will be seen by the following tables :

Species represented by more than ten specimens are distributed as follows :

Confined to Galapagos.

Amblyomma : all from Albemarle except one from Narboro.

Tetragnatha : Albemarle, Narboro.

Lathrodectes : Bindloe, Tower, Charles, Chatham.

Olios : Narboro, Albemarle, Chatham.

Gasteracantha : James, Charles, Chatham, Narboro, Albemarle.

Loxosceles : Albemarle, Hood.

Known from Central American Region.

Theridium : Albemarle, James, Narboro.

Argyropeira : Albemarle, James, Narboro.

Argiope : Albemarle, James, Narboro, Charles, Hood, Bindloe, Barrington, Indefatigable.

Epeira prompta : Albemarle, James, Narboro.

Epeira oaxensis : Albemarle, James, Charles, Chatham, Hood, Duncan, Barrington, Indefatigable.

Epeira labyrinthea: Albemarle, James, Narboro, Charles, Chat-ham, Hood, Barrington, Bindloe, Tower, Abingdon, Indefatigable.

Cyclosa: Albemarle, Narboro, Hood, Indefatigable.

Argyrodes: Albemarle, Narboro.

From these considerations I conclude that the Arachnidan fauna of these islands is more closely related to that of the Central American region than to that of any other portion of the globe.

TECHNICAL DESCRIPTIONS.

Order *ARANEIDA*.

Family *FILISTATIDÆ*.

FILISTATA FASCIATA sp. nov.

(Pl. I, fig. 15.)

Length 5 mm.

Cephalothorax dull yellowish: legs similar, with not very distinct dark marks on the femora beyond middle, and base and tip of tibia, and on tip of metatarsus; abdomen dark brown above, with two pale spots at base and four curved pale bands, the intermediate two being barely interrupted on the middle line, none of them reaching the sides, also an indistinct apical spot; venter rather paler than dorsum, especially at base; sternum yellowish. Cephalothorax of usual shape (broken and positions of eyes not evident); palpi large and heavy; legs rather short and hairy; abdomen large; projecting considerably beyond the spinnerets.

Two specimens, one young, from Wenman in December. Easily recognized by its banded abdomen and legs. It will fall in F. O. P. Cambridge's genus *Filistatoides*; but I do not deem a division of *Filistata* to be necessary.

Family *SCYTODIDÆ*.

SICAROIDES ULTRIFORMIS Butler.

Thomisoides ultriformis BUTLER, Proc. Zool. Soc. Lond., 1877, p. 77.

Several specimens from Hood Island, May. Described from the Galapagos. The genus occurs in Central America and Chili.

LOXOSCELES LONGIPALPIS sp. nov.

(Pl. I, fig. 13.)

Length ♀ 11 mm.

Cephalothorax, legs and sternum pale yellowish, the legs more reddish toward tip; the mandibles pale reddish brown; dorsal groove

and anterior furrows blackish; eyes on black spots; abdomen grayish, more yellow below; in the male the palpi are yellowish on femora and patellæ, reddish beyond; the eyes in groups as usual, the S. E. in the female fully their longest diameter from the M. E., in the male they are closer to the M. E. Otherwise the structure is similar to *L. rufescens*, but the male palpus, especially the tibial joint, is much longer than in that species.

Ten specimens from Albemarle and Hood, May.

Family PHOLCIDÆ.

CORYSSOCNEMIS CONICA sp. nov.

(Pl. I, figs. 1, 2, 3.)

Length 4.5 mm.

Cephalothorax pale yellowish; with a median brown stripe, not quite reaching to hind border, but in front extending down to clypeus, broad in front, with parallel sides to beyond middle where it is suddenly constricted to one half the width; a curved brown stripe each side which is connected to the cornea of the median stripe; each group of side eyes is situated on a jet black spot; legs pale, faintly greenish, with a brown preapical band on femora and tibiæ beyond which is a band of pure white. Abdomen rather bluish gray, indistinctly marked with darker patches. Cephalothorax broad and flat, eye-region slightly elevated. The median eyes small and above the anterior laterals. Legs long and very slender. Abdomen elevated behind into a pointed cone; the epigynum prominent.

Two specimens from Hood in May.

CORYSSOCNEMIS INSULARIS sp. nov.

(Pl. I, fig. 6.)

Length 4 mm.

Cephalothorax yellowish, black around eyes, a broad median brown stripe reaches from eyes to near hind margin, suddenly narrowed before dorsal groove, a brown median stripe on clypeus; mandibles pale reddish brown; legs pale brownish, with a very distinct apical white band on all femora and tibiæ; abdomen bluish gray, without marks, paler beneath. Structure as in *C. conica*, but the legs are much stouter and longer than in that species, and the abdomen is not prolonged above in a pointed cone, but broadly rounded behind, although it projects considerably over the spinnerets; the epigynum is large and prominent, reddish brown.

One specimen from Iguana Cove, Albemarle Island; in June.

Family DYSDERIDÆ.

ARIADNE TARSALIS sp. nov.

(Pl. I, fig. 9.)

Length 8 mm.

Cephalothorax yellowish brown, scarcely darker in eye-region, side margin black; mandibles dark red-brown, almost black at tips; sternum and legs yellowish, metatarsi and tarsi of anterior pairs dark brown, metatarsus I nearly blackish at tips; abdomen dark gray above, slightly paler beneath; spinnerets pale. General structure as usual; tibiæ I and II with four pairs of stout spines beneath; metatarsi I and II with nine pairs of spines beneath; a few spines on tibia and metatarsus III; no spines on leg IV except small one under base and one at tip of metatarsus.

A few specimens from Culpepper Island, December.

This is not the *Segestria æquatoria* of Marx, which is a genuine *Segestria* of usual appearance; herring-bone mark on back, and banded legs.

Family DRASSIDÆ.

PROSTHESIMA GALAPAGOENSIS sp. nov.

(Pl. II, fig. 7.)

Length 5 mm.

Cephalothorax uniform yellowish brown, margins black; mandibles more red-brown; legs and sternum more yellowish; abdomen grayish brown, paler beneath. Posterior eye-row slightly procurved, the P. M. E. oval and touching at hind angles, about their short diameter from the equal P. S. E.; quadrangle of M. E. once and one-half higher than broad, broadest in front: anterior eye-row plainly procurved, A. M. E. rather larger than P. M. E., less than their diameter apart, and still closer to the equal A. S. E. Sternum but little longer than broad, broad in front, but little wider in middle, pointed behind between the hind coxæ. Legs moderately slender, no spines under tibiæ I and II, one at base and one near tip under metatarsi I and II, many on hind pairs, some above. Abdomen one and three-fourths times as long as broad, but little depressed, and not much widened in the middle, truncate at base, pointed behind.

One female from Albemarle taken at sea level near Iguana Cove in June.

PÆCILOCHROA BIFASCIATA sp. nov.

(Pl. I, fig. 4.)

Length 5.5 mm.

Cephalothorax and legs shining yellowish brown; the mandibles and sternum more reddish brown; eyes on black spots; abdomen pale

yellowish, a narrow scarcely visible basal black band, a broad sub-basal band, a still broader, middle band, and two small spots each side near tip, black; spinnerets black; venter pale. Posterior eye-row distinctly recurved; the P. M. E. round, fully their diameter apart, and as far from the equal P. S. E., anterior eye-row procurved, some distance in front of the posterior row, the quadrangle of M. E. being nearly twice as long as broad; A. M. E. larger than P. M. E., less than their diameter apart, and about one-half their diameter from the smaller A. S. E. Metatarsi and tarsi I and II with scant scopulas; three pairs of spines under metatarsus I and II; sternum truncate in front, scarcely wider in middle, blunt behind; abdomen depressed, the male with a basal reddish horny plate extending nearly to middle band.

One male from Narboro in January. Taken from Termite excavations in a piece of dried wood washed ashore near the northeast point of the island.

Family CLUBIONIDÆ.

AYSHA PACIFICA sp. nov.

(Pl. I, fig. 11.)

Length ♂ 4.5 mm.; ♀ 5.5 mm.

Cephalothorax pale yellowish brown; the dorsal groove and an irregular stripe each side not reaching hind margin, brown; eyes on black spots; mandibles dark red-brown; legs pale yellowish, hind tibiæ distinctly banded with blackish near tip; abdomen pale, marked with blackish, a large elongate spot each side near base, followed by a series of small and irregular spots, blackish (in the male these marks nearly cover the dorsum); venter and sternum pale (in male with three median spots on venter). P. M. E. rather larger than other eyes, A. M. E. fully equal to A. S. E.; clypeus very low; mandibles stout, but nearly vertical; legs of moderate length; fold of venter much nearer to base than to tip. Palpus of male small.

Two specimens from Albemarle in January, and one from Chatham in May.

Family AGALENIDÆ.

TEGENARIA DERHAMI Scopoli.

SCOPOLI, Entom. Carniolica, p. 400 (1763).

One specimen from water cask (filled in Tagus Cove, Albemarle Island) on schooner, in February. A cosmopolitan species; the specimen may have come from San Francisco, and not now belong to the Galapagos fauna.

Family DICTYNIDÆ.

DICTYNA PARIETALIS Cambridge.

CAMBRIDGE, Biol. Cent. Amer., Arach. Araneida, 1, p. 171 (1896).

One specimen from Albemarle Island, in March.

Apparently the same as this common Mexican species.

Family THERIDIIDÆ.

THERIDIUM MIXTUM Cambridge.

CAMBRIDGE, Biol. Cent. Amer., Arach. Araneida, 1, p. 206 (1898).

Twenty specimens from Albemarle in March; from James in April; and from Narboro in April. Described from Guatemala; also occurs in Texas, and probably in northern South America. Both pale and dark colored forms were taken on same day and at same place.

THERIDIUM sp.

A small, pale species, with a large globose abdomen. The cephalothorax with a broad black stripe, broader behind than in front; abdomen with a large black basal spear mark, on each side of which is a white mark and a white dot; leg I with reddish at tip of femur and tibia, also on tip of tibia IV.

One female from Albemarle in January. Near to *T. limaense*. Found in a curled leaf, containing also a cocoon and adult of *Ayscha pacifica*.

LATHRODECTES APICALIS Butler.

BUTLER, Proc. Zool. Soc. Lond., p. 75 (1877).

Twenty-seven specimens from Bindloe, June; Tower, June; Chatham, May, and Charles, May. Described from the Galapagos. It is very much like our common *L. mactans* Koch. Does not appear to have been found on Albemarle, though collecting was extensive there at the proper time.

Theridium carolinum Butl. *ibid.* is, I think, without doubt, a young specimen of *Lathrodectes*.

ARGYRODES JUCUNDUS Cambridge.

CAMBRIDGE, Proc. Zool. Soc. London, p. 326 (1880).

KEYSERLING, Die Spinn. Amer. Therid., p. 190 (1884).

Ten specimens from Albemarle, January, and Narboro, January. Described from Brazil; occurs also in Mexico and extreme southern California.

Family EPEIRIDÆ.

GASTERACANTHA INSULANA Thorell.

THORELL, Nya Exotiska Epeirider; Öfv. K. Vet. Akad. Forh., p. 302 (1859).

Twenty-seven specimens from Albemarle, January and June; Charles, May; Chatham, May; James, April; and Narboro, January. Described from the Galapagos. Recorded by both Butler and Marx. It belongs to a group of species very common throughout the warmer parts of America. Those from Chatham Island have the dorsum mostly black, with two rather small spots on anterior half; in the other specimens these spots cover most of the anterior part of the dorsum.

ARGIOPE ARGENTATA (Fabricius).

Aranea argentata FABRICIUS, Entom. System., II, p. 414 (1793).

Argiopes argentata C. KOCH, Die Arach., v, p. 38 (1839).

Sixty-four specimens from Albemarle, May; Charles, May; James, April; Narboro, April; Hood, May; Bindloe, June; Barrington, May; and Indefatigable, May.

Very common throughout tropical and subtropical America.

EPEIRA OAXENSIS Keyserling.

KEYSERLING, Sitzungsber. d. Isis, Dresden, p. 121 (1863).

KEYSERLING, Die Spinn. Amer., Epeiridæ, p. 238 (1893).

E. cooksonii BUTLER, Proc. Zool. Soc. Lond., p. 76 (1877).

E. vertebrata MCCOOK, Proc. Acad. Nat. Sci. Philad., p. 196 (1888).

One hundred and nine specimens from Albemarle, March; Charles, May; Chatham, May; James, April; Hood, May; Indefatigable (many), April; Barrington, May, and Duncan, May.

E. cooksonii was described from the Galapagos; *E. vertebrata*, from California, and later (McCook, Amer. Spid., vol. III, p. 152), recorded from the Galapagos. Marx has called attention to the fact that the two are one species, and in manuscript also refers them to *E. oaxensis*, with which I fully concur; this last species was described, as its names indicates, from Mexico.

EPEIRA LABYRINTHEA Hentz.

HENTZ, Journ. Bost. Soc. Nat. Hist., v, p. 471 (1847).

Eighty-seven specimens from Albemarle, Charles, Chatham, James, Hood (many), Narboro, Tower, Indefatigable, Barrington, Bindloe and Abingdon Islands, in February, March, April, May and June. Widely distributed throughout North and some parts of South America. Dr. Marx had, in manuscript, proposed to consider this a dis-

tinct species, but many of the specimens agree perfectly with specimens from the United States, and the variations are not extreme.

EPEIRA GREGALIS Cambridge.

CAMBRIDGE, Biol. Cent. Amer., Arach. Araneida, 1, p. 22 (1889).

KEYSERLING, Die Spinn. Amer., Vol. IV, Epeiridæ, p. 177 (1892).

Four specimens from Narbora Island in April.

Described from Panama; recorded by Keyserling from Brazil.

EPEIRA PROMPTA Hentz.

HENTZ, Journ. Bost. Soc. Nat. Hist., v, p. 472 (1847).

E. parvula KEYS., Besch. n. Orbitel., p. 131 (1864).

Eleven specimens from Albemarle, Narbora, and James islands, in February, March, and April. Described from the United States; occurs quite commonly in Mexico and Central America. An extremely variable species, but these specimens are of an ordinary form.

CYCLOSA CAUDATA Hentz.

HENTZ, Journ. Bost. Soc. Nat. Hist., VI, p. 23 (1850).

Sixty-five specimens from Albemarle, Hood, Narbora and Indefatigable islands, in January, February, March, April and May. A species widely spread over the United States, Mexico and Central America.

ARGYROEPEIRA NIGRIVENTRIS Keyserling.

KEYSERLING, Neue Spinn. a. Amerikas, I, p. 316 (1879).

A. fragilis CAMBRIDGE, Biol. Cent. Amer., Arach. Araneida, I, p. 6 (1889).

A. volupis KEYSERLING, Die Spinn. Amer., Vol. IV, Epeiridæ, p. 356 (1893).

Ten specimens from Albemarle, Narbora, and James islands in February and April. Described from New Granada (Colombia); recorded by Cambridge from Guatemala, and by Keyserling from Brazil. One specimen comes from Cocos Island.

TETRAGNATHA GALAPAGOENSIS sp. nov.

(Pl. I, fig. 10.)

Length ♀ 10 mm., ♂ 7 mm.

Cephalothorax, mandibles and legs pale yellowish, eyes on black spots, fang of mandibles dark red-brown, tips of legs dark; abdomen brownish yellow, with a pale irregular stripe around base and on sides, indistinct in the male, venter in the female with a median brown stripe. Eyes with S. E. as widely separated as M. E., and A. S. E. rather smaller than the others. Mandibles in both sexes as long as

the cephalothorax, deflected at angle of 45° , slightly divergent, subcylindrical, seen from the side scarcely convex above. In the male there is, on the under side, a row of about twelve teeth at nearly equal distances apart, those at the tip stouter but not much longer than those toward base; above there are three large subequal teeth near tip, on inner side four, a small one near base, close to it one of the others, these three being subequal in size and very much smaller than those at tip. The fang reaches in an even curve almost to the base of mandibles, its apical third on inner margin is microscopically denticulate. In the female there is one tooth over base of fang, and one near apical fourth, on inner margin; below there is a row of six to eight small teeth; the fang at base beneath is swollen in a blunt tooth. Legs moderately slender, femur I fully twice as long as cephalothorax. Abdomen about twice the length of the cephalothorax, in male nearly cylindrical, in female swollen at base above. The tibia and patella of male palpus are subequal in length, femur very long.

Twenty-two specimens from Albemarle and Narboro islands in February and March. Differs from all described species in the armature of the male mandibles.

Family THOMISIIDÆ.

TMARUS STOLZMANNI Keyserling.

(Pl. II, fig. 5.)

KEYSERLING, Die Spinn. Amer., Laterigradæ, p. 138 (1880).

Two specimens from Albemarle Island in March. Described from Peru. It agrees with the description and figure, except that there is a broad brown stripe on the venter of these specimens as usual in the genus. The agreement of the male palpus makes the identification certain.

MISUMENA INCLUSA sp. nov.

Length 6 mm.

(Pl. I, fig. 12.)

Cephalothorax pale yellowish, side of caput rather darker; eye region surrounded by a white line leaving only an opening behind between the P. M. E.; a faint white median line on caput; legs pale yellowish, unmarked, spines black; sternum yellowish; abdomen pale grayish above and below. Quadradrangle of M. E. slightly broader above, about as high as broad above; eyes of posterior row subequal in size; A. S. E. larger than A. M. E. which are about equal to P. M. E., eyes of anterior row at subequal distances; tibiæ I and II scarcely as long as cephalothorax, beneath with two rows of

four spines; metatarsi I and II with five pairs beneath; none on the femora; abdomen convex, broadest beyond the middle.

The male has a brown stripe on each upper side of the cephalothorax; eye region as in female; legs I and II with the greater part of patellæ, apical third of tibiæ, apical two-thirds of metatarsi, and apical half of tarsi, red-brown; a red-brown stripe on each side of abdomen, and a series of median marks above.

One pair from Tagus Cove, Albemarle Island, in March.

Family SPARASSIDÆ.

HETEROPODA VENATORIA Linn.

LINNÉ, Syst. Nat., Ed. x, p. 1037 (1758).

Aranea regia FABRICIUS, Syst. Ent., II, p. 408 (1793).

Six specimens from Charles and Chatham, in May. A common and widely distributed tropical spider; its northward range extends through the extreme southern parts of the United States.

SELENOPS GALAPAGOENSIS sp. nov.

(Pl. I, fig. 8.)

Length 12 mm.

Cephalothorax reddish; side-margins, dorsal groove and around eyes, black; mandibles red-brown; legs pale, metatarsi black, femora and patellæ marked above with blackish bands, those on tibiæ are often darker, confluent, and extend around the joint; sternum paler, apparently slightly bifid at tip; abdomen pale brown above, paler below, above with blackish markings more or less plain, a basal spear-mark and side spots. The epigynum differs much from *S. aïssa* Walck, and *S. spixi* Perty.

Six specimens from Chatham and Albemarle in February.

OLIOS GALAPAGOENSIS sp. nov.

(Pl. I, fig. 7.)

Length 16 mm.

Cephalothorax yellowish, darkest in front; mandibles black; legs yellowish, metatarsi and tarsi brown; sternum pale yellowish; maxillæ and lips, except tips, dark brown; abdomen brownish above, with a basal darker spear-mark, margined with pale spots; venter pale, with a median brown stripe. Extremely similar to *O. fasciculatus* of Mexico and the southwestern United States. Differs in the rather smaller size, and proportionately longer legs, most noticeable when comparing leg II where the tibia plus patella of *O. fasciculatus* is only equal to the tibia of *O. galapagoensis*.

Fourteen specimens from Chatham, Albemarle and Narboro in January and March.

Family CTENIDÆ.

ODO INSULARIS sp. nov.

(Pl. I, fig. 14; Pl. II, fig. 12.)

Length ♀ 17 mm., ♂ 13 mm.

Cephalothorax yellowish brown, with a broad black stripe on each side, leaving an equally broad median area, side-margins black, eye-region black; mandibles black, red-brown on tips; legs yellow-brown, the tibiæ with black bands at base and beyond middle; palpi blackish on last joint; sternum red-brown, blackish on sides; abdomen blackish above, with an irregular pale central area, broken into spots behind; venter pale, with a few scattered dark dots. Eyes as figured for *O. agilis*; mandibles long; lip broader than long; sternum broad; legs long and stout, three pairs of spines under tibiæ I and II, two under these metatarsi, several spines above on tibiæ. Legs of male very slender.

A few specimens from Tagus Cove, Albemarle Island, in February and March.

ODO GALAPAGOENSIS sp. nov.

Length 12 mm.

(Pl. II, fig. 2.)

Cephalothorax clear yellowish, black side-margin; eye-region black, and a broad black stripe on each side, leaving a broad area which narrows behind head, then suddenly widens to surround the black-margined dorsal groove; mandibles red-brown; sternum yellow-brown; legs yellow-brown, usually with apical bands on femora, and basal and preapical ones on tibiæ; dorsum of abdomen mottled with gray and black, below pale, with a few black dots. The S. E. of posterior row are not so far back as usual, the S. E. of lower row are rather oblong, the two rows rather closer together than usual; lip broader than long; sternum broad; legs slender, but two pairs of spines under tibiæ I and II, and two under these metatarsi; no spines above on anterior tibiæ, but several on posterior.

A few specimens from Hood in May, Tower in June, and Chatham in May.

Family LYCOSIDÆ.

LYCOSA GALAPAGOENSIS sp. nov.

Length 12 mm.

(Plate II, Fig. 3.)

Cephalothorax yellowish brown, with a pale stripe through the middle, narrow on eye-region, widened behind, then suddenly constricted,

then slightly widened again, then tapering to hind margin; the lateral margins irregularly pale; eye-region black; mandibles dark red-brown; palpi yellow-brown, the last joint blackish; legs yellow-brown, usually showing faint darker bands on femora and tibiae, especially of those of the hind pairs, the tarsi of anterior pairs darker; sternum and maxillae reddish brown; abdomen blackish above, with a spear-mark at base, margined each side by pale; venter pale. Anterior eye-row nearly straight, the M. E. about one-half their diameter apart, slightly farther from the subequal S. E., eyes of second row less than diameter apart, eyes of third row equal to those of second; legs moderately stout, on leg I three pairs of spines under tibiae, the basal pair as long as width of joint, two pairs under metatarsus I.

Several specimens from Iguana Cove, Albemarle Island, in December and June; and Chatham, in May.

LYCOSA ALBEMARLENSIS sp. nov.

(Plate II, Fig. 10.)

Length 12 mm.

Cephalothorax brown; a narrow median pale stripe starting in eye region and reaching hind margin, of nearly even width throughout, and a submarginal pale stripe each side; in the brown near the median stripe is an indistinct oblong pale spot; eye region black; mandibles light yellow-brown; legs and palpi brownish yellow, darker on tips, rarely with indistinct bands; sternum and maxillae yellowish; abdomen black, a spear-mark at base, margined by pale, which behind is broken into spots; venter pale. Anterior eye-row slightly recurved, M. E. less than one half their diameter apart, plainly farther from the slightly smaller S. E.; eyes of second row less than their diameter apart; legs of moderate size, tibia I with three pairs of spines beneath, the basal pairs much longer than width of tibia; metatarsus I with two pairs of long spines on basal half beneath.

Several specimens, all from Albemarle, in January.

LYCOSA SNODGRASSI sp. nov.

(Plate II, Fig. 1.)

Length ♀ 16 mm., ♂ 13 mm.

Cephalothorax brown, with a rather broad pale median stripe, starting as a line between eyes of the second row in front; dorsal groove, with a small indentation each side, a submarginal pale stripe each side quite close to the margin; eye region and mandibles black; legs and palpi brownish yellow, darker on metatarsi and tarsi; sternum and maxillae dark; abdomen dark brown above, in female scarcely

marked, in male with a large basal pale area containing a dark spear-mark; venter pale or light brown. Anterior eye-row slightly procurved, the M. E. less than one-half their diameter apart, much farther from the plainly smaller S. E.; eyes of second row a little less than diameter apart; legs stout; on tibia I three pairs of spines beneath, the basal pair (in the female) much shorter than width of the tibia, in male longer; on metatarsus I two pairs of short spines, in male long ones.

A few specimens from Albemarle in June, Hood in May, and Chatham in May.

Family ATTIDÆ.

PLEXIPPUS PAYKULLI Aud. et Sav.

AUDOUIN et SAVIGNY, Descr. d. l'Egypte, xxii, p. 172 (1827).

Attus ligo WALCKENAER, Ins. Aptères, I, p. 426 (1837).

Two specimens, one from Tagus Cove, Albemarle, March, the other from James in April. A common tropical spider, extending northward into the southern parts of the United States.

MARPTUSA CALIFORNICA Peckham.

PECKHAM, Attidæ of N. Amer., p. 81 (1888).

One male from Albemarle, in March. Does not appear to differ from typical Californian specimens. Known also from Mexico.

CYRBA INSULARIS sp. nov.

Length 6.7 mm.

Cephalothorax black, abdomen dull black above and below, no trace of the white lines seen in *C. taniola*, but venter with a row of pale dots each side; legs brownish yellow, the first pair darkest, though none are black on any of the joints; palpi pale; sternum reddish brown. Cephalothorax flat, similar to *C. taniola*, as is the structure throughout. Epigynum shows a pale cavity nearly as broad as long, traversed by two red parallel lines connected behind.

One specimen from Tagus Cove, Albemarle Island, in January.

ADMESTINA INSULARIS sp. nov.

(Plate II, Fig. 4.)

Length 3.8 mm.

Black, with black, white and yellow hairs, the white and yellow slightly scale-like; cephalothorax with mostly black hair, a narrow white side-margin; abdomen above and below sparsely, but regularly clothed with white hairs and a few yellow ones on middle of sides

above, not enough to form markings; legs black, the coxæ, patellæ and a band on tibiæ and tarsi of hind pairs pale, and here clothed with white hair; some white hair above on basal joints of palpi. Cephalothorax long, narrow and flat, thoracic part scarcely widened; anterior eye-row slightly up-curved, the eyes of second row rather nearer to those of the third row than to laterals of first row. Legs short, I the stoutest, especially the tibia, which is sparsely clothed with long fine black hairs; legs without spines, except two on anterior metatarsi and some weak ones at tips of tibiæ III and IV; some stiff bristles above on the femora. Lip much longer than broad; anterior coxæ separated by width of lip, hind coxæ contiguous, abdomen long, slender, depressed; spinnerets distinct.

One male from Mangrove Point, Narboro Island, in April.

Appears to be as close to *Admestina* as to any genus yet described.

PHILÆUS PACIFICUS sp. nov.

Length 4 mm.

Cephalothorax reddish brown, darkest in eye region, in male there is a white stripe each side of eye region, but no trace of white median spot; legs and mandibles yellowish brown, leg I quite dark, hind pairs often pale; abdomen margined with a whitish stripe; in female pale above, with four pairs of black spots; in male shining brown, with three pairs of white dots. Mandibles of male elongate and porrect. Similar in structure to *P. militaris*, but smaller.

Five specimens from Albemarle and Narboro in January and April.

Order ARTHROGASTRA.

PHRYNIDA.

CHARINUS INSULARIS sp. nov.

(Pl. II, fig. 8.)

Length 9 mm.

Cephalothorax, mandibles and palpi red-brown; legs more yellowish; abdomen light brown above; coxæ and venter paler. Cephalothorax very broad and short; palpi of usual length; femur in front above with three short spines, below three longer ones, the basal one the longest; the tibia has above in front five spines, the first near the middle being short, the next three increasing in length, and the fifth shorter than the second; below there are two spines, the apical the longer; the hand has on inner side two spines, the apical much the longer, and on outer side near tip one spine; legs short, hind tibiæ four-

jointed, the basal joint as long as the three others; metatarsus as long as first joint of tibia; tarsus tipped with a pulvillus; sternum is rather small.

Eight specimens from Albemarle, Narboro, Chatham, and Hood in March and May.

This genus is found only in Australia, in islands of the Pacific, and in southern Asia.

SCORPIONIDA.

HADRUIDES LUNATUS Koch.

Koch, Verh. zool. bot. Ges., Wien, p. 235 (1867.)

H. maculatus THORELL, Atti Soc. Ital., XIX, p. 186 (1877).

H. charasus KARSCH, Mitt. Münch. Ent. Ver., III, p. 135 (1879).

Nineteen specimens from Albemarle, James, Barrington and Narboro, in March, April and May.

Distributed along the coast region of western South America.

CENTRURUS PRINCEPS Karsch.

KARSCH, Mitt. Münch. Entom. Ver., III, p. 121 (1879).

KRAEPELIN, Mitt. Mus. Hamburg, VIII, p. 139 (1891).

Six specimens from Hood and Chatham in May. Previously known only from Hayti, but the specimens agree with this species in all important particulars. The hand is hardly fuscous; the body is pale brownish, sometimes with traces of transverse dark marks; one specimen shows the region between the submedian ventral keels darker than elsewhere; there are ten full keels on segments one to three; on under side of fifth segment is a median keel, also a lateral keel and a submedian keel, which latter, however, is not complete but lost in the granulation of the general surface; the tubercle under the sting is very small; the fingers show the lobe and cavity as described by Karsch. The largest specimen is about 44 mm. long.

PSEUDOSCORPIONIDA.

ATEMNUS INSULARIS sp. nov.

(Pl. II, fig. 11.)

Length 3.7 mm.

Cephalothorax and abdominal scutæ yellowish brown, darker on anterior half of cephalothorax; palpi reddish brown, darkest on fingers; legs pale. Cephalothorax rounded in front, once and one-third as long as broad; at anterior third there is a short transverse depression; on anterior margin are two white eye-spots. Mandibles

small; lower finger with a minute stylet near tip. Palpi large, stout; femur broadest near base, convex on inner side near base; tibia about equal to femur, convex each side; hand stout, tapering each side to the fingers, which are much shorter than the hand. The trochantins show plainly in all legs. Abdomen elongate, nearly three times as long as cephalothorax, the scutæ entire; body and appendages sparingly clothed with simple hairs.

Seventeen specimens from Albemarle in January and February.

CHELANOPS NIGRIMANUS sp. nov.

(Pl. II, fig. 6.)

Length 2.9 mm.

Cephalothorax nearly black; palpi dark red-brown, black on hand, nearly so on base of femur and middle of tibia; legs pale greenish brown; abdominal scutæ reddish brown. Cephalothorax much tapering in front, with an eye-spot on each side; palpi moderately long; femur subcylindric, about as long as cephalothorax is broad in middle; tibia fully as long as femur, long pedicellate, inner margin slightly concave before tip; hand nearly twice as broad as femur, rounded at base, tapering each side to fingers, which are plainly, though not greatly, shorter than the hand, and slightly curved; on the trochanter, femur and tibia the hairs are short and thick, but not plainly clavate; similar hairs border the abdominal scutæ.

One specimen from Albemarle in March.

SOLPUGIDA.

AMMOTRECHA SOLITARIA sp. nov.

(Pl. I, fig. 5.)

Length, without mandibles, 10 mm.

Cephalothorax uniform dull brown; mandibles brown above; fingers red-brown; legs and palpi pale yellowish, the femora, tibiæ and base of metatarsi of hind pairs blackish brown; abdomen uniform dull brown above, paler beneath. Cephalothorax with a median furrow, eye-tubercle slightly elevated; eyes scarcely their diameter apart; palpi short and slender, the tibia equal to femur, the metatarsus one-half the length of the tibia, the tarsus two-thirds the length of the metatarsus. The movable finger of the mandibles has two large teeth, and one small tooth at the base of the first large one; the upper finger has three small teeth, then a large one with a small one on its outer base, then two rather small teeth; there is a small ridge above on the finger.

One specimen from Iguana Cove, Albemarle Island, in December.

Order *ACARINA*.

Family *IXODIDÆ*.

AMBLYOMMA PILOSUM Neumann.

NEUMANN, Mém. Soc. Zool. France, p. 209 (1899).

Many specimens from Albemarle in March; one from Narboro in April. Described from the Galapagos Islands from a specimen in the Marx collection.

ARGAS TRANSVERSA sp. nov.

(Pl. II, fig. 9.)

Length 1.1 mm.; width 2.1 mm.

Blackish, legs paler. Body flattened, nearly twice as broad as long; around the margin are rows of tubercles, each bearing a short stiff bristle, the upper row with the longest bristles; the surface above is traversed by many irregular lines, dividing the surface into irregular flattened elevations; a median and two lateral depressions and two behind; below granulate on sides; behind the legs the surface is clothed with yellowish sharp denticles; legs short, scarcely visible from above, hairy; mouth-parts small.

One specimen from Tagus Cove, Albemarle Island, in February. Easily recognized by shape of body.

Family *TYROGLYPHIDÆ*.

TYROGLYPHUS sp.

A few specimens from Narboro Island, in March. Not sufficient material for determination.

PART II.

FIELD NOTES ON SPECIES DESCRIBED IN PART I.

BY ROBERT E. SNODGRASS.

SICAROIDES ULTRIFORMIS.

Rare; secured at only one place in the archipelago, viz., under rocks on flat area at top of cliffs west of Gardner Bay, Hood Island. The soil at this place and the unweathered under sides of the surface rocks are of a bright brick-red color. All the individuals of this spider seen were also of this same color. They were, accordingly, inconspicuous so long as they remained quiet. Several other normally colored species occurred at the same place.

The eggs are inclosed in a cup-shaped case, having a flat top with a projecting rim (Plate III, fig. 9). A nest secured is composed of fine particles of earth held together in a delicate network of threads (Plate III, fig. 10), having, consequently, the same color as the rock to which it was attached, and, were it not for its extraordinary shape, would appear to be a part of it. The nest was taken in April. In September numerous young spiders had emerged through a transverse slit-like opening near the top, extending so far around that the top was almost separated from the rest like a lid.

LOXOSCELES LONGIPALPIS.

All the Hood Island specimens were taken at the same locality as the last species. They occurred in the crevices of rocks lying on the surface. Some were without webs, others had an irregular one spun about them in the recesses of the rock.

CORYSSOCNEMIS CONICA.

Found only on Hood Island, under rocks at top of cliffs west of Gardner Bay, along with last two species. Spins an irregular web on the under surfaces of rocks. Exceedingly swift in its movements. On disturbing one it first darted out of its web, then as quickly back again, and, clinging to the center, vibrated it so rapidly as to be almost invisible.

AYSHA PACIFICA.

Rare in the archipelago. The Albemarle specimens were both taken in the Turtle Point mangrove swamp. One was secured in a net by beating the leaves of the trees, the other was taken with its

cocoon within the cavity of a dead pendent mangrove leaf having the two edges rolled together (Plate III, fig. 2). The Chatham specimen was taken from an exposed cocoon containing the adult and numerous young ones.

DICTYNA PARIETALIS.

Only one specimen seen. Taken at Tagus Cove, Albemarle Island, from irregular network of straight threads spun about the end of an acacia twig.

THERIDIUM MIXTUM.

Found only on Albemarle, Narbora and James Islands. On Albemarle the species was found only on the dryer parts of the island. It was abundant in the dry, brushy region surrounding Tagus Cove, but none were found at Iguana Cove or in the mangrove swamps. Of the two Narbora specimens one is from the southeast side of the island at an elevation of about 1,500 feet, the other is from the mangrove swamp at Mangrove Point. The James specimens were taken at James Bay.

The webs constructed by this species on the Galapagos Islands generally consist of a large and irregular network of threads spun across one another in all directions, most frequently attached to the side of the trunk of a Palo Santo tree (the only tree of the islands) or suspended between the trunks of two neighboring trees. One was found in the hollow of a dead Palo Santo stump. Often the web has the form of a flat sheet. Two specimens taken at Tagus Cove had apparently appropriated deserted webs of *Epeira labyrinthea*, since they were found in webs consisting in part of a network like that spun normally by their own species, but having connected with it also a regular orb.

The spider remains in the center of the web concealed beneath a shelter formed of bits of foreign material generally taken from the immediate vicinity, and resembling an accidental accumulation of such matter. For example, hiding places of webs in acacia bushes were generally made of bits of acacia leaves; the hiding place of one suspended in the hollow of a dead stump was made of pieces of dead wood, while hiding places of webs on the sides of trees frequently had bits of bark in them. The one specimen from James Island had its hiding place formed of a small sheet of closely-spun silk in the center of the web, together with a few bits of dead twigs and a dried leaf. In one case the spider had for its nest a curled leaf bent into a U-shape, suspended at the center of the web with the arms hanging downward (Plate III, fig. 6). Beneath the middle of the leaf is an inverted cup-shaped cavity used by the spider as its retreat. In another web was

found a large, elaborate and artistically constructed nest (Plate III, fig. 5) made of twigs and leaves, and so bound together with threads as to form, beneath and within the mass, a spacious chamber accessible through a circular opening in one side. To the upper part of the side of this nest are attached two small spherical egg cocoons (*eg*).

LATHRODECTES APICALIS.

For the most part rare in the archipelago. Common only on Charles where they were found in May about Black Beach and were especially common along the lower part of the road leading from the beach to the upper parts of the island. They live here in cavities of lava fragments lying loosely on the ground, spinning an irregular web about the entrance to their retreat. The spiders usually keep out of sight, but may generally be found in some crevice or hole of the lava blocks near the web.

On Chatham only a few individuals were seen, and the species was rare on Tower. On Bindloe it was rather abundant. The webs were here generally on the ground at the side of loose stones, or had one edge attached to the stone and the other to the ground. The spiders themselves hid, as did those on Charles Island, in crevices of the stones near the webs.

ARGYRODES JUCUNDUS.

Mostly taken from the web of a *Gasteracantha insulana*, some taken from small orbs attached to large ones of this species, one taken alone in an isolated orb. In the first two cases the *Gasteracantha* webs were occupied also by their proper owners.

GASTERACANTHA INSULANA.

Common on all the islands on which it occurs, except James. Has no special habitat. About Tagus Cove, Albemarle, equally abundant on the dry hillsides and in the wettest parts of the mangrove swamps; common also in the Narbora mangrove swamps, but very scarce in the swamps of Elizabeth Bay, Albemarle; abundant at sea level at Iguana Cove, Albemarle, and specimens found here also at 2,000 feet elevation.

The species constructs large regular orbs always vertical or nearly so. The spiders are conspicuous everywhere on account of their color and are easily captured for they make no attempt to escape or to deceive the intruder. Apparently they have no natural enemies on the islands.

ARGIOPE ARGENTATA.

This spider is common on most of the larger islands. It constructs large regular orbs, each having a conspicuous white zig-zag band spun across the center, remaining itself at the center of the orb with the abdomen directed upward and away from the web. When approached it leaps through one of the meshes of the web and assumes a similar position on the side away from the intruder so quickly that one does not easily observe the change of position, noticing only a sudden movement of the spider.

In January small individuals were abundant in the patches of salt grass growing along the inner edge of the mangrove swamp at Turtle Point, Albemarle. These constructed three sorts of webs. One was a plain simple orb, another had the white zig-zag line through the center, or several such lines, the third had a white central disc formed of a thread spun irregularly but closely over the hub of the orb. The spiders in these webs with central discs first reversed their positions on the web when disturbed, and then, if further annoyed, dropped into the grass; those in the other webs dropped at once.

Egg cocoons may be hung directly in the orbs, but are more frequently suspended in straight lines spun miscellaneously at one side of the orb. A large number of spiders often inhabit a small bed of cactus, the space not occupied by their orbs being mostly taken up with a network of straight lines bearing egg cases. These are flat (Plate III, fig. 8), all of some shade of green or yellow, and have the edges drawn out into angular lobes where the supporting threads are fastened.

The species is pretty generally distributed, living in barren as well as in fertile places. It is infrequent within the mangrove swamps, but their edges form a favorite habitat.

EPEIRA OAXENSIS.

By far the most abundant spider of the archipelago, but absent on all the northern islands—Abingdon, Bindloe, Tower, Wenman and Culpepper. Predominates on all the islands in its range except on Hood where it is surpassed in numbers by *Epeira labyrinthica*. They construct large strong-threaded orbs between bushes at a height of from one foot to six or seven feet. At Iguana Cove, Albemarle Island, the webs were so numerous that scarcely any two neighboring bushes were without at least one web between them, and often a narrow passage in the vegetation would be spanned by many webs placed abreast of one another. Walking here was very disagreeable on ac-

count of the webs. At James Bay, on James Island, the species was present in enormous numbers, being here even more numerous than at Iguana Cove. On Charles the webs were of such strength that they often entangled and firmly held the large powerful variety of *Schistocerca melanocera* that occurs here. On the other islands the species was less numerous, though abundant on Chatham and Indefatigable.

EPEIRA LABYRINTHEA.

Most widely distributed spider of the archipelago—unknown only on Duncan, Wenman and Culpepper. Second in numbers to *Epeira oaxensis*; predominates over this species on Hood Island, where individuals are also of unusually large size. The species occurs wherever there is vegetation, but not on the barren lava fields.

The webs are of the ordinary form as made by the species elsewhere, consisting of an orb and labyrinth. The hiding place in the center of the labyrinth consists ordinarily of a few bits of leaves. Anomalous forms, such as the following, are frequently met with. A Tagus Cove spider had the labyrinth spun about the end of a twig of cotton, and made the tip of the twig serve as a hiding place. A web was found on the northern Seymour Island consisting merely of a vertical orb a few inches from the ground, suspended above by a long horizontal thread attached at each end to bushes. In the bush at one end of this line was a very small labyrinth consisting of a few short threads spun irregularly across one another. In this was suspended an egg cocoon at the lower end of which the spider had her retreat. In some cases hiding places consisted of a small sheet of white silk suspended horizontally in the center of the labyrinth, sometimes with bits of foreign matter attached. A Barrington spider had its orb inclined at an angle of about forty-five degrees and the nest was suspended by means of a few threads near the upper edge of the orb.

The Hood Island individuals, in nearly all cases, constructed very scanty labyrinths. They generally consisted of merely a few lines radiating outwards from the hiding place, or egg cocoon, to convenient points of attachment. There were commonly only about five of these lines, and they usually lay all in one vertical plane, parallel with the orb. The number of lines observed varied from two to eight. Where but two were present, one extended upward and the other downward, virtually, one line. One web was found on this island constructed on more nearly the ordinary type, having the labyrinth composed of a large number of threads, but in this case even, most of the threads lay in a plane parallel with the orb. Labyrinths of these styles are

frequently met with on the other islands but are by no means the prevailing types. Two individuals were found on Hood Island having each an orb but no labyrinth. In each case the spider was at the center of the orb on a small vertical sheet of closely spun silk.

Males are infrequently met with; only one was found having an orb web, two were taken in labyrinths without orbs; all the other males of the collection were taken from the webs of females.

The eggs are enclosed in elongate, conical cases (Pl. III, fig. 7) hung vertically in the center of the labyrinth, and often decorated on the outside by bits of dried leaves. A cavity in the lower end of the cocoon serves the spider as a hiding place, the original one being discarded when the cocoon is formed. The interior of the cocoons (Pl. III, fig. 1) is divided by horizontal septa into several superimposed chambers. In each is placed a spherical mass of eggs covered over with a soft and rather thick covering of silk, but the entire pellet does not nearly occupy all of the cell.

EPEIRA GREGALIS.

Found at only one place in the archipelago, viz., at Mangrove Point, Narboro Island. One specimen was taken from an empty basal capsule of a mangrove pod. At the side of this was a horizontal orb web connected with the cavity of the capsule by a gangway of threads. All the other specimens were taken from a colony of eight nearly vertical orbs and numerous intersecting lines spun miscellaneously amongst the forks of a piece of dead mangrove wood lying on the beach. Three of the orbs were occupied by a spider at the center. Attached to the straight threads at the side of the empty webs were a number of egg cocoons, some of them open and some of them closed. Two adult spiders were taken from closed cocoons; one was taken from an open case in which were also numerous moulted skins of young spiders.

EPEIRA PROMPTA.

The webs of this species are the same as those of *Cyclosa caudata*, consisting of a vertical orb with a long horizontal line above. On Albemarle the species was found only amongst the bushes in the small canyon at the head of Tagus Cove. On Narboro it was common on the lava fields along the eastern shore. The webs were here mostly stretched across fissures in the lava. Early in the morning the spiders were to be found in the centers of their webs, but an hour or so later none were to be seen. When disturbed they ascend the orb to the horizontal line at the top and run along this to the rock at one side, hiding there in some crevice.

CYCLOSA CAUDATA.

Most abundant on the lava fields of Albemarle north and east of Tagus Cove and west of Elizabeth Bay, and on Narboro along the east shore; a few found in the brushy vegetation immediately about Tagus Cove; rare at James Bay on James Island and on the southern Seymour Island; found elsewhere only on Hood. On the last island there are no open lava fields. The species, though not abundant on Hood, was not scarce, and its webs were nearly always to be found in open rocky places.

In its habits this species, on the Albemarle and Narboro lava fields, was almost gregarious, for wherever found there were generally present in the immediate vicinity a large number of individuals. They constructed their webs under projecting ledges of lava, between neighboring lava blocks, amongst the multitude of sharp pinnacles and rough prominences of the lava surface, but especially in the fissures of the lava. In fissures three to four feet wide often a great many webs occurred close to and parallel with one another stretched across from one side to the other. In one such crack in the lava field, inland about a mile from Tagus Cove, were counted fifty parallel webs of this species in a length of about fifteen feet.

The webs are vertical orbs generally supported above by a thick, straight, horizontal line having accessory stay lines running from it to the webs at the sides of and below the orb. The spider occupies the center of the orb, and usually, not always, when approached, first rapidly vibrates the web, then if the intruder approaches still nearer and attempts to molest the spider or even touches the web, ascends to the upper horizontal line and runs along this toward the support at one end. If still further annoyed the spider closes its legs beneath the body and drops to the ground, where it relies for protection on its remaining motionless and on its resemblance to the particles of lava and soil amongst which it has fallen.

Egg cocoons were found in several webs at Tagus Cove, in March. The cocoons were elongate papery cases attached to a thick vertical thread, running from the center of the orb in some cases to the upper horizontal line, and in others to a support several feet above the orb.

ARGYROEPEIRA NIGRIVENTRIS.

A rare Galapagos species. Found on Albemarle only in the mangrove swamps west of Elizabeth Bay. The Narboro specimen was taken on the southeast slope of the central mountain at an elevation

of about 1,500 feet. Almost the entire surface of this island consists of barren lava of apparently recent date. A few small scattered remnants of an older and rather luxuriant vegetation, however, have been left uncovered, and it was on such an oasis that the specimen of this species was taken. It was the only Epeirid found here. The single James Island specimen was taken at James Bay.

This species is the most common Arachnid of Cocos Island, where it generally constructs a fine, light and very delicate orb, but often simply an irregular network of straight threads.

TETRAGNATHA GALAPAGOENSIS.

Taken only on Narboro Island at Mangrove Point and on Albemarle Island west of Elizabeth Bay. The webs are generally horizontal. The Narboro specimens were taken in mangrove swamps. Some of the Albemarle specimens are from reedy swamps back of the mangrove swamps along the shore, and others were taken on the barren lava, where they were associated with *Cyclosa caudata*.

TMARUS STOLZMANNI.

Both specimens taken in the small brushy canyon at head of Tagus Cove, Albemarle. When disturbed they attempt to escape notice by remaining perfectly motionless on a twig, with the long anterior legs stretched out straight in front of the body.

MISUMENA INCLUSA.

Specimens all taken under bark of trees. The Albemarle specimens are from the Elizabeth Bay mangrove swamps. None could be found in the Turtle Point swamp on Albemarle, which swamp is, with regard to all other species, much richer than the Elizabeth Bay swamps.

HETEROPODA VENATORIA.

Common on Charles and Chatham Islands under stones, beneath bark of trees and in houses. Charles and Chatham are the only islands that have been inhabited for any length of time.

OLIOS GALAPAGOENSIS.

Found only at Tagus Cove, Albemarle, on Chatham and on Narboro. Taken at Tagus Cove from sea level to top of neighboring mountain—4,000 feet; found on ground and in holes of large carpenter bee (*Xylocopa*) in branches of bushes.

Three egg-cocoons were secured—one on Chatham, one on Albemarle and one on Narboro. The Chatham nest (Plate III, fig. 3) is ovate, the longer diameter an inch and a half, and is composed of a tough, papery web-fabric. It was attached in an upright position by its larger end to an Acacia branch about six feet above the ground. There was no opening, but within was an adult female and a packet of eggs. The Albemarle nest resembles the Chatham one, but is smaller and has an opening in the top closed by a flap which the female within drew tightly shut when disturbed by thrusting one of her legs over the outside of it. In this one were the adult female and numerous young spiders. The Narboro nest (Plate III, fig. 4) differs from the other two. It consists of a silken cell attached to the upper surface of a flat mangrove leaf, and has two curled leaves closely fastened down to its top and sides, being thus flattened, and wholly hidden within the leaves. It had no opening, but contained, as did the Chatham nest, a packet of eggs, and an adult female who was very active when liberated. The eggs, in both cases, were held in a spherical mass by a very gauzy silk wrapping.

ODO INSULARIS.

Specimens taken on the ground under logs about Tagus Cove, Albemarle.

LYCOSA GALAPAGOENSIS.

Found rather abundant on Chatham Island about Wreck Bay and in the higher cultivated parts. The Albemarle specimens were taken at sea level near Iguana Cove. Not met with elsewhere in the archipelago.

LYCOSA ALBEMARLENSIS.

Taken only in the long wet salt grass growing about the inner edge of the Turtle Point mangrove swamp, Albemarle Island.

LYCOSA SNODGRASSI.

Taken on Chatham and Albemarle at the same localities as *Lycosa galapagoensis*. The Hood specimens were secured under rocks near Gardner Bay.

PHILÆUS PACIFICUS.

The Narboro specimen was taken from the inside of a silk cocoon, otherwise empty, attached to a mangrove leaf in a swamp at Mangrove Point.

CHARINUS INSULARIS.

Rather rare in the archipelago; found on the ground under logs and stones. The Albemarle specimens were taken at Tagus Cove in

very dry places; those from Narbora were found at an elevation of 1,500 feet on the side of the central mountain of the island.

HADUROIDES LUNATUS.

Found more numerous about Tagus Cove on Albemarle than anywhere else in the archipelago. Not abundant, however, here. Found under bark of trees and beneath logs and stones, often in excessively dry places. One specimen was dug up from eight inches below the surface and another found at top of Tagus Cove mountain, 4,000 feet.

CENTRURUS PRINCEPS,

Rather abundant under rocks on Hood Island. On Chatham found only at an elevation of 1,000 feet in the interior of island.

ATEMNUS INSULARIS.

Found only on Albemarle. Rather common under the bark of trees in the Turtle Point mangrove swamp. A diligent search in the swamp at Elizabeth Bay at the same time of year yielded only one specimen.

CHELANOPS NIGRIMANUS.

This Pseudoscorpion apparently has a very different habitat from the last. The single specimen obtained was found within the hollow of a dead twig of a bush in the small, very dry valley at the head of Tagus Cove, Albemarle. The cavity in the twig opened to the exterior by a small round hole in one side.

AMMOTRECHA SOLITARIA.

Only one individual met with. Found under a log at Iguana Cove, Albemarle.

AMBLYOMMA PILOSUM.

Extremely abundant on the land tortoises of the archipelago. Found adhering, often in great numbers, to the loose skin of the neck and about the bases of the legs and tail. Abundant also on the vegetation of Albemarle, but not found on birds.

ARGAS TRANSVERSA.

The single specimen taken was found on a leaf of a bush growing at an altitude of 1,200 feet on the Tagus Cove mountain.

TYROGLYPHUS sp.

All taken from orb-webs on the lava fields of Narbora near Mangrove Point.

PLATE I.

- FIG. 1. *Coryssocnemis conica*, cephalothorax.
2. " " " eyes.
3. " " " side view.
4. *Pæcilochroa bifasciata*.
5. *Ammotrecha solitaria*, mandible.
6. *Coryssocnemis insularis*, side view.
7. *Olios galapagoensis*, epigynum.
8. *Selenops galapagoensis*, epigynum.
9. *Ariadne tarsalis*.
10. *Tetragnatha galapagoensis*, mandible.
11. *Ayscha pacifica*, epigynum and palpus.
12. *Misumena inclusa*, epigynum and palpus.
13. *Loxosceles longipalpis*, palpus.
14. *Odo insularis*, palpus.
15. *Filistata fasciata*.

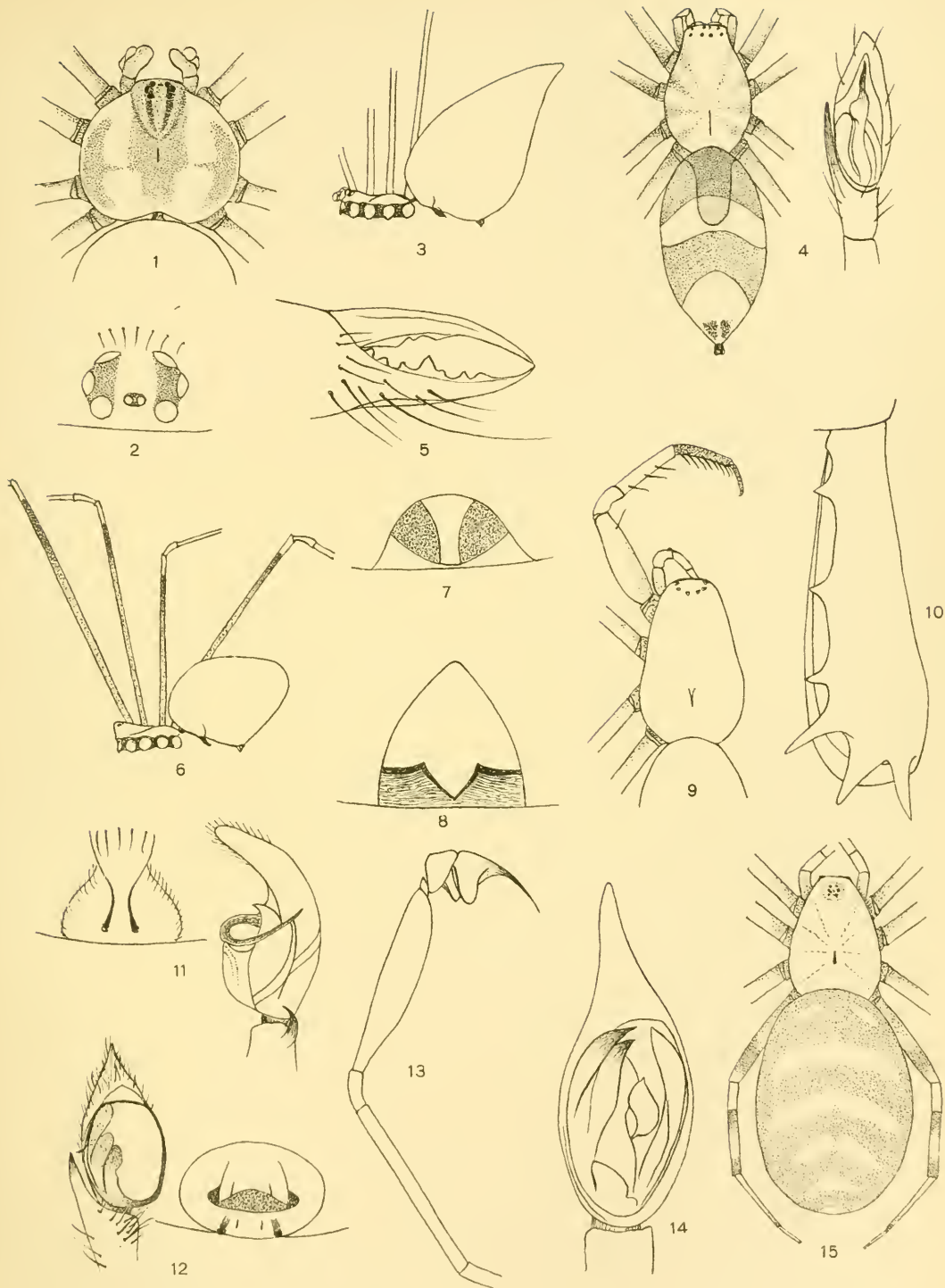
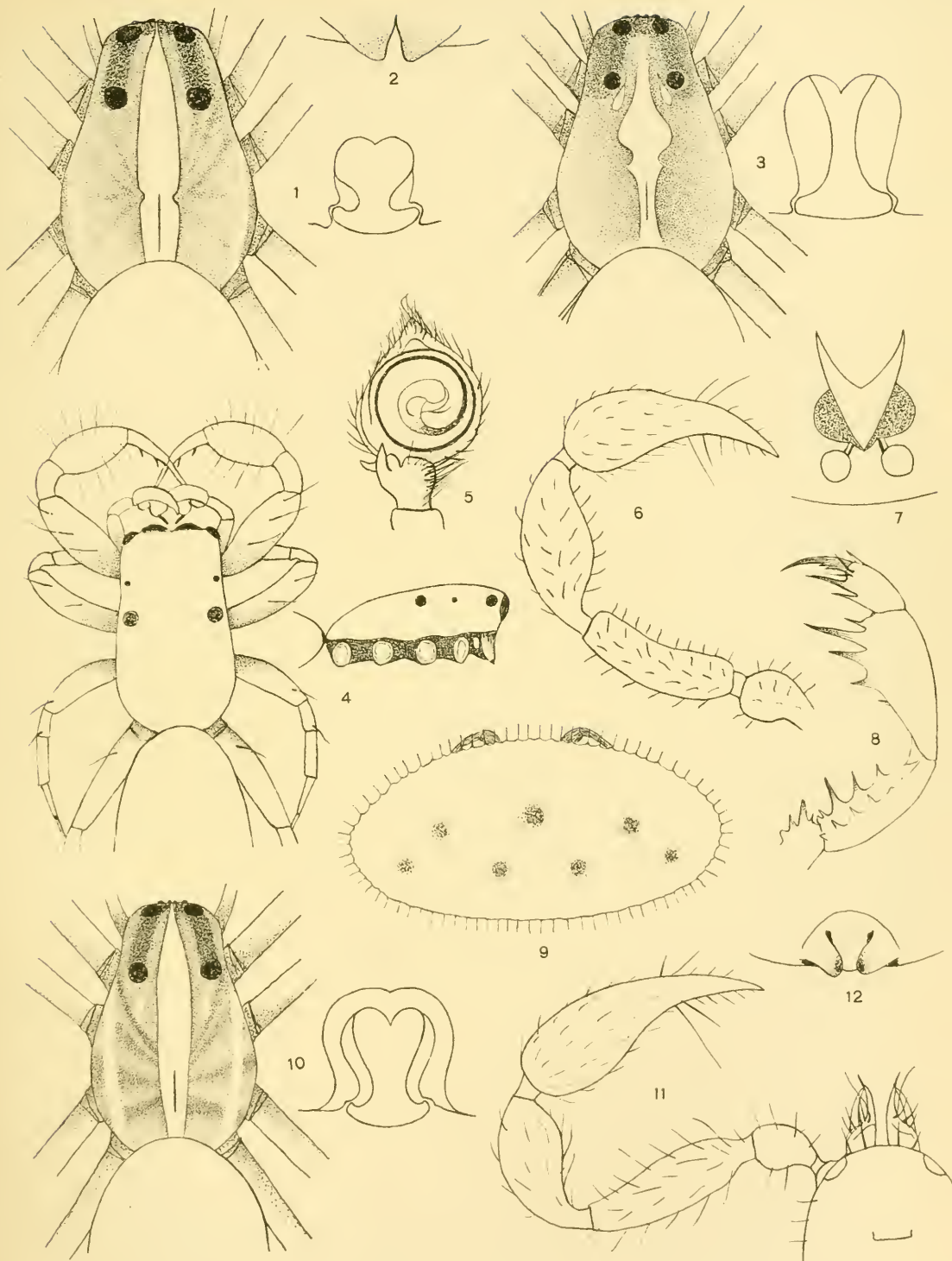


PLATE II.

- FIG. 1. *Lycosa snodgrassi*.
2. *Odo galapagoensis*, epigynum.
3. *Lycosa galapagoensis*.
4. *Admestina insularis*.
5. *Tmarus stolzmanni* palpus.
6. *Chelanops nigrimanus*, palpus.
7. *Prothesima galapagoensis*, epigynum
8. *Charinus insularis*, palpus.
9. *Argas transversa*.
10. *Lycosa albemarlensis*.
11. *Atemnus insularis*.
12. *Odo insularis*, epigynum.



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PLATE III.

- FIG. 1. Egg cocoon of *Epeira labyrinthea* with side removed to show chambers and egg packets. ($\times 2\frac{1}{2}$.)
2. Curled mangrove leaf containing nest of *Ayscha pacifica*. Natural size.
3. Nest of *Olios galapagoensis*. Natural size.
4. Three mangrove leaves containing nest of *Olios galapagoensis*. $\frac{1}{2}$ natural size.
5. Hiding place and egg cases (*eg*) of *Theridium mixtum*. ($\times 1\frac{1}{2}$.)
6. Hiding place of *Theridium mixtum*. ($\times 2$.)
7. Egg cocoon and hiding place of *Epeira labyrinthea*. ($\times 1\frac{1}{2}$.)
8. Egg cocoon of *Argiope argentata*. ($\times 2$.)
9. Egg cocoon of *Sicaroides ultriformis* attached to piece of lava. Natural size.
10. Particles of lava composing egg cocoon of *Sicaroides ultriformis*, showing binding threads. ($\times 18$.)



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PAPERS FROM THE HARRIMAN ALASKA
EXPEDITION.

XXVII.

APTERYGOTA.

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THIS paper deals with the Collembola and Thysanura collected in Alaska in June and July, 1899, by Professor Trevor Kincaid, of the Harriman Expedition, with the addition of a few forms collected by him in 1897. These are especially welcome as nothing has been published hitherto concerning the Collembola of Alaska, and because, with three exceptions, all of Professor Kincaid's species are either new or little known. Moreover, they suggest interesting problems in geographic distribution, a subject yet in its infancy, as regards this group. Fourteen forms are here described as follows:

| | |
|--------------------------------------|--------------------------------------|
| <i>Neanura gigantea</i> Tull. | <i>Entomobrya kincaidi</i> sp. nov. |
| <i>Neanura ornata</i> sp. nov. | <i>Tomocerus niger</i> Bourl., type. |
| <i>Anurida amorita</i> sp. nov. | <i>Tomocerus niger</i> Bourl., var. |
| <i>Aphorura octopunctata</i> (Tull.) | <i>arcticus</i> Schött. |
| <i>Aphorura dentata</i> sp. nov. | <i>Tomocerus niger</i> Bourl., var. |
| <i>Isotoma fimetaria</i> (L.) Tull. | <i>americanus</i> Schött. |
| <i>Isotoma viridis</i> Bourl., type. | <i>Papirius palmatus</i> sp. nov. |
| <i>Isotoma viridis</i> Bourl., var. | <i>Machilis arctica</i> sp. nov. |
| <i>arctica</i> Schött. | |

Types of the above species and subspecies have been deposited in the United States National Museum, and all the Harriman specimens retain the numbers of the original labels.

NEANURA GIGANTEA Tull.

(Pl. IV, fig. 1; Pl. VI, figs. 11-13.)

Anura gigantea TULLBERG, Öfv. k. vet. Akad. förh., xxxiii, no. 5, p. 41, taf. 11, fig. 59, 1876 (Siberia).—SCHÖTT, K. sven. vet. Akad. hand., xxv, no. 11, p. 94, 1894 (Siberia).
Neanura gigantea SCHÄFFER, Fauna Arctica, 1, lief. 2, p. 240, 1900.

General color of alcoholic specimens indigo blue, with conspicuous blackish tubercles (fig. 1); living examples pruinose (Tullberg). Head twice as broad as long, with twelve large tubercles, including those bearing the eyes, arranged as in fig. 1. Eyes (fig. 11) five on either side. Postantennal organs (figs. 11, 12) each composed of more than 100 clavate papillæ forming a rosette. Antennæ half as long as the head, conical, with segments related in length as 4:3:2:6; basal and second segments half as long as broad; third and fourth coalescent; the minute antennal tubercles become successively smaller on each segment. Body oval in dorsal aspect; the number of large tubercles on each successive segment is, respectively, 6, 8, 8, 8, 8, 8, 6, 2; the tubercle at either end of each transverse row is behind the others, on the first seven segments; on the seventh, both are also ventral and inconspicuous; on the eighth, four are ventral and two dorsal; the ninth segment is bent under and bears two small tubercles. Legs short and stout; claws (fig. 13) alike, stout, uniformly curving and tapering, strongly unidentate on the inner margin and minutely tuberculate. Cuticula finely tuberculate; large tubercles also reticulate (fig. 11), bearing several long stiff yellow setæ. Maximum length, 5 mm.

Two forms occur: broad ones, in which breadth is to length as 1:1.79; and narrow ones, in which the ratio is 1:2.27. This difference of proportion is independent of age, as it exists between specimens of equal length; it is found in other species of *Neanura*, and is presumably a sexual distinction.

Twenty-five specimens, St. Paul Island, Bering Sea, 1897.

The original description, although brief, suffices to place this well marked and monstrous species. Tullberg and Schött have recorded it from several localities in Siberia, Yenisei River (Latitude 61° to 73°). Schött also notes the species from the vicinity of St. Lawrence Bay. Tullberg (1876, p. 29) is confident that *Neanura gigantea* does not occur in Nova Zembla, Spitzbergen or Greenland.

NEANURA ORNATA sp. nov.

(Pl. IV, fig. 2; Pl. VI, figs. 14-18.)

White (fig. 2). Head (fig. 14) slightly longer than broad, rounded triangular. Eyes (fig. 14, *e, e, e*) not more than three on either side, in longitudinal alignment; two are close together and immediately behind the base of the antenna; the third is considerably behind these. The eyes are rudimentary; they lack pigment, and even the cornea, especially of the posterior eye, is frequently indistinguishable. Post-antennal organs absent. Antennae (fig. 15) barely more than half as long as the head, with segments related as 5:4:4:6; basal segment stout, globose, reticulate; second and third globose, slightly or not at all reticulate; fourth conical, reticulate, the minute tubercles successively smaller on the first three segments but of equal size on the second and fourth. The large tubercles which characterize the genus coalesce on the head of this species but are indicated by the arrangement of the setigerous, reticulated areas. Buccal cone as in figure 16. Body segments related in length as 3:4:5:6:5:5:4:2:2; apical segment reduced and turned under; the number of large tubercles on each successive segment is, respectively, 6, 8, 8, 8, 8, 8, 8, 6, 2; on the fourth abdominal segment the two paramedian tubercles coalesce, while four are ventral; on the penultimate segment all six coalesce and on the apical segment the two tubercles are ventral. Each tubercle, though but slightly elevated, is defined by its chitinous reticulation and by two to four stiff serrulate setae of two forms (fig. 17). The minute cuticular tubercles are not hemispherical as in other species of the genus, but are conical (fig. 17) and frequently clustered. Legs short and stout, with stout curving setae; tibiae with a subapical pair of appendages (fig. 18), pyriform in outline; claws (fig. 18) alike, apically curving, prominently unidentate at the base of the inner margin. Length, 1.4 mm.

As in *N. gigantea*, there are two forms, probably the sexes; a narrower kind (fig. 2) with abdomen gradually dilating, with average breadth to length as 1:2.8, and a broader form, oval-cylindrical, in which breadth: length = 1:2.

Type.—Cat. No. 5435, U. S. Nat. Museum.

Described from thirty-five types, Sitka, June, 1899 (No. 71).

Neanura ornata does not closely resemble any described species but recalls in its ocular characters an East Indian species, *N. fortis* Oudm. (Oudemans, 1890, p. 91; Schäffer, 1898, p. 399).

ANURIDA AMORITA sp. nov.

(Pl. iv, fig. 3; Pl. vi, figs. 19-24.)

General color bluish gray, due to the combined effect of indigo blue mottlings with the white ground color (fig. 3). The dorsum of each segment has two parallel broken blackish stripes (fig. 3). Eyes (fig. 19) five on either side, on blackish patches. Postantennal organs oval (fig. 20) or bent, as in fig. 21 (both figures are from the same head), with from thirty to forty elements. Antennæ almost as long as the head; segments related as 12 : 12 : 11 : 10; first three dilated apically; fourth rounded conical, bearing an organ (fig. 22) consisting of three large contiguous bladder-like structures upon a chitinous base. Body (fig. 3) elongated, abdomen gradually dilated. Claws of mid and hind feet (fig. 23) gradually tapering from a broad base, slightly curving, strongly unidentate near the middle of the inner margin; claws of fore feet (fig. 24) smaller and less tapering. Clothing of short dense curving setæ, with a transverse row of long hairs on each segment. Maximum length, 4.1 mm.

Type.—Cat. No. 5437, U. S. Nat. Museum.

Described from thirty-six types, Kukak Bay (No. 70).

This species is most nearly allied to *A. tullbergi* Schött (1891, p. 192; 1894, pp. 91-92, taf. 8, figs. 16-18) which, however, has but twenty-four to thirty-eight elements in each postantennal organ, and more slender, untoothed claws, not to mention differences of minor importance. The curious antennal organ, already found on *A. maritima*, attains a much greater size in *A. amorita*.

APHORURA OCTOPUNCTATA (Tull.).

(Pl. vii, figs. 25-28.)

Lipura octo-punctata TULLBERG, Öfv. k. vet. Akad. forh., xxxiii, no. 5, p. 40, taf. 11, figs. 51-53, 1876 (Siberia).—SCHÖTT, K. sven. vet. Akad. hand., xxv, no. 11, p. 88, 1894 (Siberia).

Aphorura octopunctata SCHÄFFER, Fauna Arctica, bd. 1, lief. 2, p. 241, 1900.

White. Postantennal organs (fig. 25) elliptical, of about thirty-three to thirty-seven elements. Pseudocelli of the head, fourteen; four behind the base of either antenna (fig. 25) and six, in two transverse rows, on the posterior border of the head. Antennæ shorter than the head, with segments related in length nearly as 7 : 10 : 9 : 12; basal seg-

ment stout, second cylindrical, third petiolate, terminal segment cylindrical with rounded apex; antennal organ (fig. 26) composed of five chitinous finger-like processes. Body cylindrical, its segments related as 23 : 26 : 29 : 25 : 22 : 27 : 27 : 10. Superior claws (fig. 27) broad, curving, distinctly unidentate near the middle of the inner margin; inferior claws slightly longer, slender, gradually attenuating into a fine filament, untoothed. Anal spines (fig. 28) two, half as long as a superior claw, feebly arcuate, on prominent papillæ. Body sparsely clothed with short curved setæ and occasional longer stiff setæ, the latter becoming more numerous towards the extremity of the abdomen. Length, 2.7 mm.

Three specimens, Sitka, June, 1899 (No. 71).

The Harriman examples of this species agree satisfactorily with the original diagnosis except for lacking a tooth on the inferior claw. The pseudocelli of the body were not studied on account of insufficient material.

A. octopunctata has seldom been recorded. It was described from a single individual taken at Dudinskoe, Siberia (Latitude 69° 25' N.), by the Nordenskiöld Expedition in 1875 (Tullberg, 1876, p. 40). The Yenisei Expedition of the following year collected examples at Tschulkova, in Latitude 62° 45' N., and the Vega Expedition of 1878-79 found a single specimen at Irkaipi, in Chukchi Land (Latitude 68° 36' N. Schött, 1894, p. 88).

APHORURA DENTATA sp. nov.

(Pl. VII, figs. 29-36.)

White (fig. 29). Postantennal organs (fig. 30) elongate, of very many minute papillate elements, underlying which are seventeen or more oval structures (fig. 31). Pseudocelli of the head eight, of which two lie behind the base of either antenna (fig. 32) and the remaining four occupy the posterior border of the head (fig. 29). The areas adjoining the antennæ are more finely tuberculate than the rest of the head. Antennæ slightly shorter than the head, with segments related nearly as 2 : 5 : 4 : 5; basal segment cup-shaped, second and third clavate and petiolate, fourth conical; antennal organ (fig. 33) of five, rarely four, stout conical processes. Body cylindrical (fig. 29); segments related as 10 : 13 : 16 : 13 : 13 : 12 : 14 : 10 : 3; the number of dorsal pseudocelli for each successive segment is, respectively (fig. 29), 4, 8, 8, 4, 4, 4, 6, 6, 0. Superior claws (fig. 34) strongly curved, five-toothed, as follows: paired pseudonychial teeth occur one-third from the base of the claw, a

second pair of lateral teeth is found one-seventh from the apex, and a fifth, or median, tooth is situated as far again from the apex; inferior claws untoothed, slender, gradually attenuating into a filament which extends beyond the superior claw, inner margin roundly and narrowly dilated at base; both claws are basally tuberculate. Anal spines (figs. 35, 36) two, less than half as long as a superior claw, almost straight, separated basally by half their length and not seated upon papillæ. Clothing of short dense curving setæ with occasional long stiff setæ on antennæ and abdomen, the latter more numerous towards the apex of the abdomen. Maximum length, 4 mm.

Type.—Cat. No. 5436, U. S. Nat. Museum.

Sixteen types: ten from Seldovia, Cook Inlet, July, 1899, under stones at tide mark (No. 62), five, Cook Inlet, 1899 (No. 60); one from St. Paul Island, Bering Sea, August 1, 1897.

Although *A. dentata* shares many of its characters with other species, in no other form do they approach a similar combination. The five-toothed claws are most distinctive.

ISOTOMA FIMETARIA (L.) Tull.

(Pl. VII, figs. 37-39.)

? *Podura terrestris alba* LINNAEUS, Fauna Suecica, Ed. 1, p. 343, 1746.

? *Podura fimetaria* LINNAEUS, Fauna Suecica, Ed. 2, 1761.

Isotoma alba TULLBERG, Öfv. k. vet. Akad. förh., xxviii, no. 1, p. 152, 1871 (Sweden).

Isotoma fimetaria TULLBERG, k. sven. vet. Akad. hand., x, no. 10, p. 48, taf. 9, figs. 32, 33, 1872 (Sweden).—TULLBERG, Öfv. k. vet. Akad. förh., xxxiii, no. 5, p. 37, 1876 (Greenland, Siberia).—MACGILLIVRAY, Can. Ent., xxiii, p. 273, 1891.—UZEL, Sitzber. k. böh. Gesell. Wiss., II, p. 66, 1891 (Bohemia).—SCHÖTT, K. sven. vet. Akad. hand., xxv, no. 11, p. 75, 1894 (Siberia).—DALLA TORRE, Die Gattungen und Arten der Apterygogenea (Brauer), p. 9, 1895.—REUTER, Acta Soc. Faun. Flora fenn., xi, no. 4, pp. 28-29, 1895 (Finland).—MACGILLIVRAY, Can. Ent., xxviii, p. 58, 1896.—SCHÄFFER, Mitt. naturh. Mus. Hamburg, xiii, p. 183, 1896 (Germany).—SCHÖTT, Proc. Cal. Acad. Sc., vi (2), p. 184, 1896 (California).—LIE-PETERSEN, Bergens Mus. Aarb. (1896), no. 8, p. 18, 1897 (Norway).—MEINERT, Vidensk. Med. naturh. Foren. Kjobenhavn (1896), p. 169, 1897 (Greenland).—LIE-PETERSEN, Bergens Mus. Aarb., no. 6, p. 13, 1898 (Norway).—SCHERBAKOF, Zool. Anz., xxi, p. 58, 1898 (Russia).—SCHERBAKOF, Materiali, etc., Apteryg., Vicinity of Kief, p. 12, 1898 (Russia).—CARPENTER and EVANS, Proc. R. Phys. Soc. Edinburgh, xiv, p. 251, pl. 8, figs. 3, 4, 1899 (Scotland).—SCHERBAKOF, Zool. Anz., xxii, p. 47, 1899 (Spitzbergen).—CARPENTER, Sc. Proc. R. Dublin Soc., ix. (n. s.), pt. 3, p. 274, 1900 (Franz Josef Land).—SCHÄFFER, Fauna Arctica, I, lief. 2, p. 247 (Massachusetts).

White. Eyes absent. Postantennal organs small, elliptical. Antennæ (fig. 37) subequal to head in length, segments related as 3:5:

5:11; basal segment stout, cylindrical; second cylindrical; third clavate, apically constricted; fourth subclavate, apically rounded. Body elongate; segments in relative lengths as 2:6:6:5:6:6:5:3:2. Superior claws (fig. 38) slightly tapering, feebly curved, inner margin excavated, untoothed; inferior claws two-thirds as long, broadly lanceolate, acute, with a longitudinal rib parallel with the inner margin; tenent hairs absent. Furcula appended to the fourth abdominal segment, short, not attaining the ventral tube; dentes nearly twice the manubrium in length, slender, uniformly tapering; mucrones (fig. 39) slender, conspicuously bidentate; apical tooth slightly hooked, second tooth larger, erect. Clothing of numerous short setæ of two kinds, stiff or curving, becoming longer toward the apex of the abdomen. Length 1.6 mm.

Two specimens, Sitka, June, 1899 (No. 71).

The Alaska specimens agree with European examples of the species which I received from Dr. Schäffer, except in having stouter claws and antennæ and in being rather larger. There is less agreement with specimens from Massachusetts, as the antennæ of the Alaskan forms are shorter as compared with them, the claws stouter and the mucrones more slender, with subequal teeth; moreover, the fourth abdominal segment, shorter than the third in the latter specimens, is twice as long as the third in the Harriman examples.

Isotoma fimetaria, well known in northern and middle Europe, is also widely distributed through the Arctic regions, as the above list shows. The species doubtless occurs extensively in the United States also, being recorded from California and having been found by myself in Massachusetts and Ohio.

ISOTOMA VIRIDIS Bourl.

(Pl. IV, fig. 4, type.)

- ? *Podura viridis* MÜLLER, Zoologiae Danicae Prodomus, p. 183, 1776 (Denmark).—? GMELIN, in Linné Systema Naturae, Ed. 13, p. 2910, 1788.
Podura viridis BOURLET, Mémoire Podurelles, p. 24, 1843 (France).
 ? *Podura plumbea* MÜLLER, Zoologiae Danicae Prodomus, p. 183, 1776.—
 ? O. FABRICIUS, Fauna Groenlandica, p. 211, 1780 (Greenland).
Isotoma viridis BOURLET, Mém. soc. sc. agric. arts Lille, Pt. I, p. 401, 1839 (France).—GERVAIS, in Walckenaer, Hist. nat. ins. apt., III, p. 433, 1844.—LUBBOCK, Monograph Coll. and Thys., p. 169, 1873 (England).
 —PARONA, Saggio Catalogo Pod. Ital., p. 42, 1878 (Italy); Ann. mus. civ. st. nat. Genova, XVIII, p. 463, 1883.—REUTER, Öfv. finsk. vet. soc. förh., XXXIII, p. 229, 1891 (Siberia).—SCHÖTT, K. sven. vet. Akad. hand., XXV, No. 11, pp. 59-61, taf. 5, figs. 1-5; taf. 6, figs. 1, 2, 1894

- (Siberia).—DALLA TORRE, Die Gattungen und Arten der Apterygogenea (Brauer), p. 10, 1895.—REUTER, Acta Soc. Fauna Flora fenn., XI, no. 4, pp. 25–26, 1895 (Finland).—MACGILLIVRAY, Can. Ent., XXVIII, p. 58, 1896 (Mass., Tex., N. Y.).—SCHÄFFER, Mitt. naturh. Mus. Hamburg, XIII, pp. 184–186, taf. 3, fig. 80, 1896 (Germany).—LIE-PETTERSEN, Bergens Mus. Aarb. (1896), No. 8, p. 17, 1897 (Norway); *ibid.*, No. 6, p. 12, 1898.—MEINERT, Vidensk. Med. naturh. Foren. Kjobenhavn (1896), p. 169, 1897 (Greenland).—SCHERBAKOF, Zool. Anz., XXI, p. 58, 1898 (Russia); Materials, etc., Apteryg. Vicinity of Kief, p. 7, 1898; Zool. Anz., XXII, p. 47, 1899 (Spitzbergen).—CARPENTER and EVANS, Proc. R. Phys. Soc. Edinburgh, XIV, p. 246, pl. 7, fig. 17, 1899 (Scotland).—WAHLGREN, Öfv. k. vet. Akad. förh., LVI, No. 4, p. 338, 1899 (Spitzbergen); Ent. Tidsk., XX, hft. 2–3, pp. 186–190, 1899 (Sweden).—KIEFFER, Berl. ent. Zeits., XLV, hft. 1–2, p. 113, 1900 (Germany).—SCHÄFFER, Fauna Arctica, I, lief. 2, p. 245, 1900; Jahreshefte Vereins vaterl. Naturk. Württemberg, LVI, p. 256, 1900 (Germany).
- Isotoma caerulea* BOURLET, Mém. soc. sc. agric. arts Lille, Pt. 1, p. 401, 1839.—GERVAIS, in Walckenaer, Hist. nat. ins. apt., III, p. 433, 1844.
- Isotoma arborea* BOURLET, Mém. soc. sc. Agric. arts Lille, Pt. 1, p. 401, 1839.—PARONA, Saggio Catalogo Pod. ital., pp. 40–41, 1878; Ann. mus. civ. st. nat. Genova, XVIII, pp. 462–463, 1883; *ibid.*, 2d ser., VI, p. 143, 1888.
- Desoria virescens* NICOLET, Recherches Podurelles, p. 59, pl. 5, fig. 12, 1841 (Switzerland).—GERVAIS, in Walckenaer, Hist. nat. ins. apt., III, p. 428, 1844.
- Desoria cylindrica* NICOLET, Recherches Podurelles, p. 60, pl. 6, fig. 1, 1841.—GERVAIS, in Walckenaer, Hist. nat. ins. apt., III, p. 429, 1844.
- Desoria viatica* NICOLET, Recherches Podurelles, p. 61, pl. 6, fig. 2, 1841.—GERVAIS, in Walckenaer, Hist. nat. ins. apt., III, pp. 429–430, 1844.
- Desoria pallida* NICOLET, Recherches Podurelles, p. 61, pl. 6, fig. 3, 1841.—GERVAIS, in Walckenaer, Hist. nat. ins. apt., III, p. 430, 1844.
- Desoria ebriosa* NICOLET, Recherches Podurelles, p. 61, pl. 6, fig. 4, 1841.—GERVAIS, in Walckenaer, Hist. nat. ins. apt., III, p. 430, 1844.
- Desoria annulata* NICOLET, Recherches Podurelles, p. 62, pl. 6, fig. 5, 1841.—GERVAIS, in Walckenaer, Hist. nat. ins. apt., III, p. 430, 1844.
- Desoria fusca* NICOLET, Recherches Podurelles, p. 63, pl. 6, fig. 7, 1841.—GERVAIS, in Walckenaer, Hist. nat. ins. apt., III, p. 431, 1844.
- Podura arborea* BOURLET, Mémoire Podurelles, p. 24, 1843.
- Podura annulata* BOURLET, *ibid.*
- Isotoma Desmarestii* GERVAIS, in Walckenaer, Hist. nat. ins. apt., III, p. 436, pl. 50, fig. 11, 1844.
- Heterotoma chlorata* GERVAIS, *ibid.*, pp. 421–422, pl. 50, fig. 6, 1844.
- Isotoma virescens* NICOLET, Ann. soc. ent. France, 2d ser., V, 1847.
- Isotoma pallida* NICOLET, *ibid.*
- Isotoma annulata* NICOLET, *ibid.*—LUBBOCK, Monograph Coll. and Thys., p. 175, 1873.—PARONA, Ann. mus. civ. st. nat. Genova, XVIII, p. 463, 1883.
- Isotoma fusca* NICOLET, Ann. soc. ent. France, 2d ser., V, 1847.—LUBBOCK, Monograph Coll. and Thys., pp. 175–176, 1873.—TÖMÖSVÁRY, Math. term. közlem. Magyar Ak., XVIII, p. 124, 1882 (Hungary).—PARONA, Ann. mus. civ. st. nat. Genova, XVIII, p. 463, 1883; *ibid.*, 2d ser., VI, p. 143, 1888.
- Isotoma anglicana* LUBBOCK, Trans. Linn. Soc. London, XXIII, Pt. 3, p. 596, 1862; Monograph Coll. and Thys., pp. 171–172, pl. 38, 1873.
- Isotoma lineata* LUBBOCK, Trans. Linn. Soc. London, XXIII, Pt. 3, p. 597, 1862.

- Isotoma palustris* var. *unicolor* TULLBERG, Öfv. k. vet. Akad. förh., xxviii, no. 1, p. 151, 1871.
- Isotoma palustris* var. *annulata* TULLBERG, *ibid.*
- Isotoma palustris* var. *viridis* TULLBERG, K. sven. vet. akad. hand., x, no. 10, p. 46, taf. 9, figs. 1-8, 1872 (Sweden, Spitzbergen, Bering Id.).—UZEL, Sitzber. k. böh. Gesell. Wiss., II, p. 63, 1891 (Bohemia).
- Isotoma palustris* var. *fusca* TULLBERG, K. sven. vet. Akad. hand., x, no. 10, p. 46, taf. 9, figs. 1-8, 1872.—UZEL, Sitzber. k. böh. Gesell. Wiss., II, p. 63, 1891.
- Isotoma Belfragei* PACKARD, Fifth Rep. Trust. Peab. Acad., pp. 33-34, 1873 (Texas).—MACGILLIVRAY, Can. Ent., xxiii, p. 273, 1891.
- Isotoma tricolor* (in part) PACKARD, Fifth Rep. Trust. Peab. Acad., p. 34, 1873 (Mass.).—MACGILLIVRAY, Can. Ent., xxiii, p. 274, 1891 (D. C.).
- Isotoma purpurascens* PACKARD, Fifth Rep. Trust. Peab. Acad., pp. 34-35, 1873 (Texas).—MACGILLIVRAY, Can. Ent., xxiii, p. 274, 1891.
- Isotoma plumbea* PACKARD, Fifth Rep. Trust. Peab. Acad., p. 35, 1873 (Mass.).—MACGILLIVRAY, Can. Ent., xxiii, p. 274, 1891 (L. I., Ohio).
- Isotoma palustris* TULLBERG, Öfv. k. vet. akad. förh., xxxiii, no. 5, pp. 34-35, 1876 (Siberia).

Alcoholic specimens are either dark green with pale green legs and furcula, or are dark brown. Dorsum marked (fig. 4) with pale round and oval spots, most numerous on meso- and metanotum. Eyes as in figure 40 (var. *arctica*), eight on either side. Postantennal organs ovate to oval. Antennæ half as long again as the head; segments in relative lengths as 4:6:6:7. Body cylindrical; segments related as 4:10:9:7:8:10:9:4:2. Superior claws (fig. 41, var. *arctica*) long, slender, tapering, slightly curving, laterally pseudonychiate, inner margin bidentate; inferior claws less than half as long, parallel sided, acute, apically curving; tenent hair unknobbed. Furcula half as long as the body; dentes nearly three times the manubrium in length; mucrones (fig. 42, *arctica*) subequally tridentate; teeth large, blunt, apical tooth falcate, second and third subfalcate and opposite each other. Clothing of dense short curving setæ, with long barbellate hairs on the posterior part of the abdomen. Length 6 mm.

Three individuals, St. Paul Id., 1897; three, Popof Id., 1899 (No. 96).

These agree in every essential respect with European examples of *I. viridis*, forma *principalis*, received from Dr. Schäffer and also with specimens collected by myself in Massachusetts, Ohio and Illinois; the Alaskan forms differ from any which I have seen, however, by being larger and in having no tooth on the inferior claw, with the exception of a single small specimen, 2 mm. long.

It is not surprising to meet *I. viridis* from Alaska, as the species has repeatedly been recorded from the Arctic regions and ranges throughout Europe and the United States.

ISOTOMA VIRIDIS Bourl.,¹ var. ARCTICA Schött.

(Pl. IV, fig. 5; Pl. VII, figs. 40-42.)

Isotoma viridis, var. *arctica* SCHÖTT, K. sven. vet. Akad. hand., xxv, no. 11, p. 61, taf. 5, fig. 4, 1894.—SCHÄFFER, Fauna Arctica, I, lief. 2, p. 245, 1900.

The preceding description of the typical form applies equally well to the variety *arctica* with the following modifications: *arctica* is longer, more slender (fig. 5) and is yellow, marked with dark blue; each of the last seven segments bears a dorsal deltoid mark by which the variety may be recognized. Length, 7 mm.

Three specimens, Popof Id., 1899 (no. 96).

The two types of Schött came from Port Clarence, on the American side of Bering Strait. Schäffer gives southern Russia as a second locality.

ENTOMOBRYA KINCAIDI sp. nov.

(Pl. VIII, figs. 43-45.)

Olive green with pale mottlings. Head yellowish, oral region dark. Eye patches widely separated; eyes (fig. 43) eight on either side. Antennæ twice as long as the head, or half as long as the body, with segments related as 3:5:4:6; basal ring blackish; basal segment yellow, dusky proximally, second yellow, third yellow, dark distally; fourth elliptical, yellow with dusky apex. Body fusiform, segments as 4:24:15:10:13:13:40:12:6 in relative lengths; sides dusky, also the anterior border of the mesonotum, and the posterior borders of the fourth and sixth abdominal segments. Legs yellowish; superior claws (fig. 44) broad, straight, inner margin bidentate, a tooth occurring one-fourth, and another one-half the distance from the apex; outer margin untoothed; inferior claws two-thirds as long, broadly linear, acute, untoothed; tenent hair single, knobbed. Furcula white, as long as the antennæ; dentes slender, one-third longer than the manubrium; mucrones (fig. 45) tridentate, as usual, with an apical hook, a second tooth which is conical, erect, and as long as the width of the dens, and a third, small acicular oblique tooth; three barbellate hairs project far beyond the mucrones. Antennæ, legs and furcula densely clothed with short curving barbellate setæ interspersed with long barbellate hairs, which are longest on the last three abdominal segments; stout clavate barbellate setæ occur between the eye patches, on the occiput and on the anterior borders of meso- and metanotum. Length, 1.9 mm.

Type.—Cat. No. 5509, U. S. Nat. Museum.

Four types, Muir Glacier ("hillside to right"), June 11, 1899 (No. 68).

In coloration *E. kincaidi* is much like *E. griseo-olivata* Pack. ('73, p. 39) but the two species differ sufficiently in structural details. In Packard's species the inferior claws are basally dilated, the mucrones strongly falcate, and the fourth abdominal segment is four times as long as the third.

Next to *griseo-olivata*, *kincaidi* is most nearly allied to *marginata* Tull. and *muscorum* Tull. (not Nic.), European specimens of which have been furnished me by Dr. Schäffer.

Named after Professor Trevor Kincaid, of the University of Washington, who has materially assisted in extending our knowledge of Arctic Collembola.

TOMOCERUS NIGER Bourl.

(Pl. VIII, figs. 46, 47.)

Macrotoma nigra BOURLET, Mém. soc. sc. agric. arts Lille, Pt. 1, p. 14, 1839 (France).—GERVAIS, in Walckenaer, Hist. nat. ins. apt., III, p. 408, pl. 50, fig. 7, 1844.

Macrotoma ferruginosa BOURLET, Mém. soc. sc. agric. arts Lille, Pt. 1, p. 14, 1839.—GERVAIS, in Walckenaer, Hist. nat. ins. apt., III, p. 408, 1839.

Tomocerus celer NICOLET, Rech. Podurelles, p. 69, pl. 7, fig. 9, 1841 (Switzerland); Ann. soc. ent. France, 2d ser., v, 1847.—PARONA, Ann. sc. r. inst. tec. Pavia, tav. 2, fig. 7, 1875 (Italy).

Macrotoma celer GERVAIS, in Walckenaer, Hist. nat. ins. apt., III, p. 407, pl. 50, fig. 7, 1844.

Macrotoma lepida GERVAIS, *ibid.*, p. 409.

Tomocerus lepida NICOLET, Ann. soc. ent. France, 2d ser., v, 1847.

Macrotoma flavescens TULLBERG, Öfv. k. vet. Akad. förh., XXVIII, no. 1, p. 149, 1871 (Sweden); K. sven. vet. Akad. hand., x, no. 10, pp. 36-37, taf. 5, figs. 1-6, 1872.—UZEL, Sitzber. k. böhm. Gesell. Wiss., II, p. 48, 1891 (Bohemia).

Tomocerus niger LUBBOCK, Monograph Coll and Thys., pp. 139-140, 1873 (England).—PARONA, Saggio catalogo Pod. ital., pp. 25-26, 1878 (Italy); Ann. mus. civ. st. nat. Genova, XVIII, p. 456, 1883; *ibid.*, 2d ser., VI, p. 139, 1888.—REUTER, Acta. Soc. Fauna Flora, fenn., XI, no. 4, p. 15, 1895 (Finland).—CARPENTER and EVANS, Proc. R. Phys. Soc. Edinburgh, XIV, pp. 236-237, pl. 7, fig. 16, 1899 (Scotland).—SCHÄFFER, Jahreshefte Vereins vaterl. Naturk. Württemberg, LVI, p. 274, 1900 (Germany).

Tomocerus flavescens SCHÖTT, K. sven. vet. Akad. hand., XXV, no. 11, p. 42, 1894 (Norway).—DALLA TORRE, Die Gattungen und Arten der Apterygogenea (Brauer), p. 11, 1895.—SCHÄFFER, Mitt. naturh. Mus. Hamburg, XIII, pp. 204-205, 1896 (Germany).—LIE-PETTERSEN, Bergens Mus. Aarb. (1896), no. 8, p. 11, 1897 (Norway); *ibid.*, no. 6, p. 8, 1898.—SCHERBAKOF, Zool. Anz., XXI, p. 60, 1898 (Russia); Materiali, etc., Apteryg. Vicinity of Kief, p. 20, 1898.—ABSOLON, Studies Morav. Cave Apt., pp. 32-33, 1900 (Moravia).

Proc. Wash. Acad. Sci., March, 1902.

Cream yellow when denuded of scales. Eyes six on either side, on black patches close behind the bases of the antennæ. Antennæ shorter than the body; basal ring prominent; first segment yellow or purplish; second and third yellow, frequently purplish apically; third often purple throughout; fourth segment purple. Legs yellow, excepting the tibiæ, which are purplish distally; superior claws (fig. 46) long, slender, uniformly tapering, straight, pseudonychiæ, inner margin bidentate, or, less than half as often, tridentate; inferior claws half as long, straight, tapering, acuminate, inner margin unidentate near the middle; tenent hair knobbed. Furcula yellow. Dental spines (fig. 47) seven to nine, becoming successively smaller toward the base of each dens until the large proximal spine is reached; the distal spine is more lateral than the rest and there may be two of them on either side; a lanceolate acuminate transparent scale occurs near the proximal spine or spines. Clothing of scales, with numerous clavate setæ on head and legs, interspersed with many long stiff hairs, especially on femora and manubrium; mesonotal collar of stiff setæ, finely barbelate apically; similar setæ occur on the manubrium among the short reclinate bristles; the furcula bears scales above and long plumes beneath. Length, 5 mm.

Twenty-one specimens, Yakutat, June, 1899 (Nos. 57, 69); three, Cook Inlet, 1899 (No. 60); one, Popof Island, 1899 (No. 96); one, Juneau, 1899 (No. 56); four, Sitka, June, 1899 (Nos. 64, 71); three, Berg Bay, June 10, 1899 (No. 72); fifty-five, Muir Glacier, west side, June 12, 1899 (No. 63), comprising intergradations between *niger*, *arcticus* and *americanus*, but consisting principally of typical *arcticus*.

Many of the specimens from which the preceding description was made conformed to authoritative descriptions and figures of the well-known *T. flavescens* (more properly termed *niger*), of Europe, and also agreed with eight examples of the species given me by Dr. Schäffer. Most of the Harriman specimens varied greatly, however, in the characters of accepted specific value—for example, those of the claws and dental spines. These variations, bearing importantly upon the interrelations of three members of the genus, are tabulated below.

Tullberg's (1872, pp. 36-37, taf. 5, figs. 1-6) diagnosis of *T. flavescens* is, "Antennæ corpore non longiores. Spinæ dentium simplices 7-8, intima magna. Unguiculus superior dentibus 2 instructus, inferior lanceolatus. Long. 4 millim." Tullberg adds that the inferior claws are unidentate. With this description compare the following records. The figures after the + signs refer to the number of large spines beside each dental scale.

| Teeth of superior claws. | | | | Dental spines. | |
|--------------------------|------------|-----------|------------|----------------|---------------------|
| Class. | Fore foot. | Mid foot. | Hind foot. | Right dens. | Left dens. |
| 1 | 2 | 2 | 2 | 5 + 2 | 7 + 2 Common |
| 2 | 3 | 2 | 2 | 6 + 1 | 6 + 1 Occasional |
| 3 | 3 | 3 | 3 | 7 + 2 | 6 + 2 Two specimens |
| 4 | 4 | 3 | 3 | ? | ? One specimen |
| 5 | 4 | 4 | 3 | 8 + 2 | 8 + 2 " " |
| 6 | 4 | 4 | 4 | 8 + 2 | 7 + 2 " " |

Excepting these variations, all the individuals are essentially alike and nearly all the variations given are found in one lot of specimens (No. 63, Muir Glacier), among which are also the forms *arcticus* and *americanus*. Individuals of class No. 1 are clearly *niger* (*flavescens*). Those of No. 2 depart from the type in having an extra tooth but are more typical than No. 1 by having but one accessory spine. Having admitted No. 2 as *niger*, how may we exclude No. 3, as regards the claws? The number of spines is normal on the left, and but one too many on the right dens. Considering the numerical variability of the spines, No. 3 could still be called *niger*. Notice, however, that No. 3 is just as evidently a variety of *T. americanus* Schött. His diagnosis (1896, p. 172, pl. 16, figs. 6, 7) provides especially for the three-toothed form. Nos. 4, 5 and 6 are clearly *americanus*, in which Schött himself found great variability and affinities with *flavescens*.

Any distinction between *niger* and *americanus*, then, must be artificial and arbitrary. This is not all, for *T. arcticus* enters the discussion. Schött (1894, pp. 43-44, taf. 3, figs. 8, 9) distinguishes *arcticus* as having (1) four teeth normally on each superior claw (five may occur on any foot, but his statement, "doch scheinen 4 Zähne auf allen das normale zu sein," holds, nevertheless), (2) "Spinæ dentium simplices, septem vel interdum octo, intima parva." The only apparent differences, therefore, between *arcticus* and *americanus* are the absence of a tooth on the inferior claws of *arcticus* and of two large spines beside each dental scale. Now the tooth mentioned was present on most of the Alaskan examples of *arcticus*, although not referred to by Schött, in whose specimens it was very likely absent. As to the accessory spines, one such is indeed mentioned by Schött and several of the Alaskan specimens, which occurred with typical *arcticus* and were unlike it in no other respect, had two well developed accessory spines. Therefore, *arcticus* and *americanus* merge together.

Comparing *arcticus* directly with *niger*, the former, when it has one accessory spine, agrees to that extent with the latter; the teeth on each superior claw of *arcticus* are not known to be less than four, and

are only two in typical *niger*; as I have implied, however, *arcticus* is connected with *niger* through *americanus*; in fact, the variety of *arcticus* with two basal spines might be called *americanus*, were its true relations with *arcticus* not known.

The dental scales also, occurring in no other described species except *T. plumbeus*, are of significant value.

To summarize: *arcticus* varies into *americanus* which, in turn, connects insensibly with *niger*. The first two, then, are properly to be called varieties of *niger* (*flavescens*)—the first described of the three. The question whether *niger* is actually nearest the stem form—a debatable subject, which I have but partially settled—fortunately does not affect the terminology to be adopted.

Although *niger* has long been known to occur throughout Europe under the name of *flavescens*, it has not been hitherto recorded from the Arctic regions.

TOMOCERUS NIGER Bourl., var. ARCTICUS Schött.

(Pl. VIII, figs. 48-52.)

Tomocerus arcticus SCHÖTT, K. sven. vet. akad. hand., XXV, No. 11, p. 43, taf. 3, figs. 8, 9, 1894.—DALLA TORRE, Die Gattungen und Arten der Apterygogenea (Brauer), p. 11, 1895.—SCHÄFFER, Fauna Arctica, I, lief. 2, p. 251, 1900.

Typical *arcticus* is citron yellow, when denuded of scales. Eyes six on either side (fig. 48), as usual. Antennæ over three times as long as the head, or two-thirds the length of the body; segments related as 2 : 3 : 13 : 3; basal ring purple; first two segments yellow, second often purplish distally; last two pale purple. Prothorax concealed; remaining segments related in length as 8 : 6 : 5 : 6 : 9 : 6 : 3 : 2. Legs yellow throughout, or else coxæ and tibiæ purplish; superior claws (fig. 49) rather stout, slightly curved, pseudonychiate; inner margin distinctly quadridentate, as a rule; superior claws of hind feet one-third longer than those of the other feet; inferior claws two-thirds as long as the large claws, lanceolate, acute, inner margin unidentate two-fifths from the apex; tenent hair knobbed. Furcula attaining the ventral tube; segments as 5 : 7 : 1, in relative lengths; manubrium yellow, remainder white. Dental spines (fig. 50) normally six or seven on either side, becoming successively smaller proximally; distal spine more lateral than the rest; two large ovate-lanceolate acuminate transparent scales occur near the manubrium. Clothing as in *T. niger*, type. Length, 3.5 mm.

One specimen, Popof Id., 1899 (No. 96); four, Cook Inlet, 1899

(No. 60); nine, Sitka, June, 1899 (Nos. 64, 71); one, Yakutat Bay, 1899 (No. 69); fifty-five, including intergrades with *niger* and *americanus*, Muir Glacier, west side, June 12, 1899 (No. 63).

In *arcticus* there is a strong tendency toward a double series of dental spines, a peculiarity limited to *arcticus*, so far as I know. The nature of the doubling is shown in fig. 51, in which certain of the proximal spines are each laterally accompanied by an extra spine. The addition of spines begins at the base of the series and proceeds distally; in fig. 52, only the basal spine of the right dens is repeated, the remaining spines being single.

There is no question about the identity of these specimens. Four is the normal number of teeth for a superior claw, as Schött says; on one pair of hind feet I found five on the right and four on the left foot, a variation mentioned by Schött. He neither describes nor figures a tooth for the inferior claw; such a tooth was distinct on most of the Harriman specimens, however, although occasionally obscure or even absent, especially on small individuals. The dental spines, rarely eight, in a normal series, were as often six as seven. The number of spines increases with the size of the individual. I may add that the dental scales disagree with Schött's figure by being acuminate instead of rounded.

The preceding description is based upon nearly typical specimens. To describe the varieties of *arcticus* would be to describe *niger* and *americanus* again, as *arcticus* varies into both those forms. The presence of an accessory spine beside each scale and a slight reduction in the number of teeth for the superior claw, variations which actually occur in the specimens from the Muir Glacier—transform *arcticus* into *niger*. The variations leading into *americanus* are given below and I have already shown (p. 99) that between *americanus* and *niger* proper, no natural distinctions exist.

Since its discovery by the Vega Expedition in 1878-79, *arcticus* has never been recorded. The types occurred in colonies at Pitlekai, Chukchi peninsula, eastern Siberia.

TOMOCERUS NIGER Bourl. var. AMERICANUS Schött.

(Pl. VIII, fig. 53.)

Tomocerus americanus SCHÖTT, Proc. Cal. Acad. Sci., VI (2), p. 172, pl. 16, figs. 6, 7, 1896.

Among the many specimens of typical *arcticus* from the Muir Glacier are several which agree with *arcticus* in every respect save that

the dental spines are nine to eleven on either side, there being one or two large additional spines near the dental scale, as in fig. 53. The same varieties, which also occurred frequently with typical examples of *niger*, are evidently *americanus* Schött (1896, p. 172) which, indeed, was described as being a very variable species. The interrelations of *americanus* and *niger* I have discussed on p. 99.

Occurred among fifty-five specimens of *arcticus* and *niger*, Muir Glacier, west side, June 12, 1899 (No. 63); also at Cook Inlet (No. 60) with typical *niger*.

PAPIRIUS PALMATUS sp. nov.

(Pl. VIII, figs. 54-56.)

Pale yellow, laterally washed with purplish, or else blackish-purple, with pale rounded lateral spots; face with a broad median purple stripe. Eyes (fig. 54) eight on either side, on large black patches. Antennæ slightly shorter than the body, purple, paler basally; third segment with six annulations behind the swollen apex; fourth lanceolate, with two annulations below the middle. Superior claws (fig. 55) long, slender, tapering, feebly curving, outer surface unidentate two-fifths from the apex; inner margins with a pair of teeth at about one-fourth, and a second pair at one-half the distance from the apex (only two teeth show in a profile aspect of the claw); inferior claw two-thirds as long as the other, lanceolate, acuminate, with a stout knobbed subapical tenent hair as long as the claw itself, and with a long stiff basal spine borne on the rounded inner margin; an extra long subapical hair occurs on the tibia. Furcula white, attaining the mouth; segments related as 3:5:2; dentes each with a lateral series of stiff setæ, of which the proximal alone is simple, the others becoming successively shorter and serrately compound (fig. 56); all the setæ are simple, though, in small individuals; mucrones (fig. 56) long, slender, concave, with twenty to thirty rounded teeth on either margin. Dorsum clothed with numerous short stiff setæ and several long spinous hairs; stiff setæ on antennæ and legs. Maximum length, 2.24 mm.

Type.—Cat. No. 5434, U. S. Nat. Museum.

Described from twenty-four types: thirteen, Sitka, June, 1899 (Nos. 64, 71); six, Yakutat, June, 1899 (Nos. 57, 58); three, Berg Bay, June 10, 1899 (No. 72); one, Kodiak (No. 65); one, Fox Point, July, 1899 (No. 67).

Papirius palmatus is most nearly allied to *P. ater* L. (Tull. 1871, p. 146; 1872, p. 34, taf. 3, figs. 26-36).

MACHILIS ARCTICA sp. nov.

(Pl. v, figs. 6-10; Pl. VIII, figs. 57, 58.)

Body (fig. 6) annulated with alternating bands of dark brown and pale yellow. Head colored as represented in fig. 57. Eyes circular in outline, contiguous along one-fifth the inner margin, or for a distance equal to about one-third the diameter of an eye. Antennæ one-quarter longer than the body; hairs white; the basal ring and the following seven segments are, in relative lengths, as 5:25:10:7:3:4:2:4; basal ring (fig. 7) yellow, bordered with brown; basal segment cylindrical, twice as long as broad, brown; remaining segments yellow, obscurely banded with brown. Maxillary palpi (fig. 8) seven-jointed, as usual, with segments related as 4:5:5:8:8:7:6; first segment constricted near the base, with a lateral finger-like process and a globose apex; remaining segments simple, cylindrical, yellow, with the following brown markings (fig. 8): A basal patch on segment two, a distinct basal ring on segment four, a diffuse basal ring on segments five and six and a subapical patch on segment five. Labial palpi (fig. 9) with segments related as 3:5:5; first segment brown, clavate, with a short apical process; second yellow, cylindrical, three times as long as it is broad; third yellow, strongly clavate. Body slender; the relative lengths of the successive segments, measured along the median dorsal line, are 9:18:10:10:9:7:9:10:11:11:11:10:7; thorax feebly arched; coxæ (fig. 10) brown; trochanter yellow; femur brown, with yellow apex; tibia brown; tarsus brown, basally and apically; claws and cerci brown. Median cercus one-quarter longer than the body, or nearly as long as the antennæ; lateral cerci nearly one-third as long as the median cercus. From a perfect specimen were taken the following measurements of relative lengths: body, 8; antennæ, 11; median cercus, 10; lateral cerci, 3.

The scales are so variable in size and form as to be of no specific value, at least in this species; the cuticular figures, however (fig. 58), will assist in distinguishing this form. Length, 8 mm.

Type.—Cat. No. 5433, U. S. Nat. Museum.

Nine types: three, Muir Glacier ("hillside to right"), June 11, 1899 (No. 68); five, Popof Island, 1899 (Nos. 59, 66); one, Sitka, June, 1899 (No. 61).

I have found no species to which *M. arctica* is closely allied. Its most distinctive characters are the relative lengths of body, antennæ and cerci, the coloration of the head, form and position of the eyes and the color and form of the antennal and palpal segments.

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PLATE IV.

- FIG. 1. *Neanura gigantea* Tull. ($\times 20$).
2. " *ornata*, sp. nov. ($\times 60$).
3. *Anurida amorita*, sp. nov. ($\times 18$).
4. *Isotoma viridis* Bourl., type ($\times 13$).
5. " " " var. *arctica* Schött ($\times 12$).

(108)



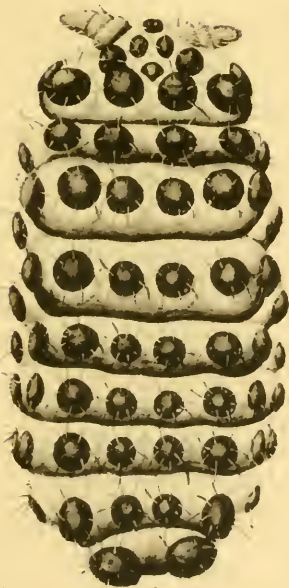
3



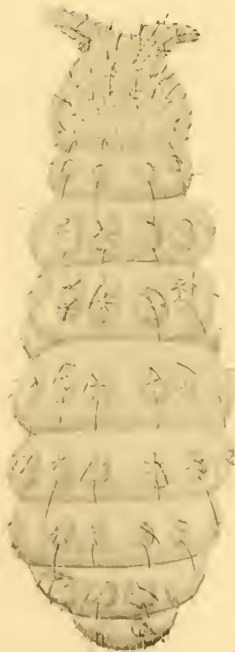
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5



1

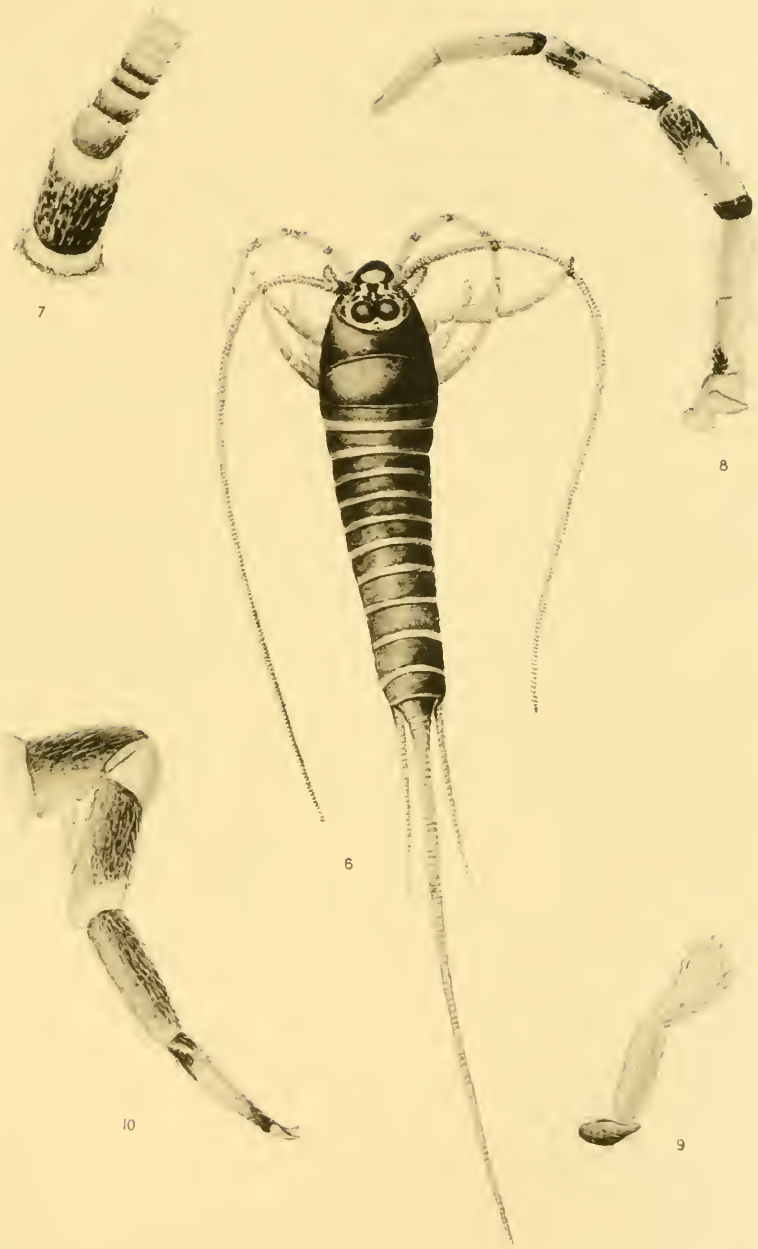


2

PLATE V.

FIG. 6. *Machilis arctica*, sp. nov. ($\times 8$).

- | | | | | | |
|-----|---|---|---|---|--|
| 7. | " | " | " | " | antenna ($\times 30$). |
| 8. | " | " | " | " | left maxillary palpus ($\times 30$). |
| 9. | " | " | " | " | right labial palpus ($\times 30$). |
| 10. | " | " | " | " | left mid leg ($\times 30$). |



ALASKA APTERYGOTA.

Stål

PLATE VI.

- FIG. 11. *Neanura gigantea* Tull.; eyes of left side ($\times 127$).
12. " " " left postantennal organ ($\times 434$).
13. " " " left aspect of hind foot ($\times 99$).
14. " *ornata* sp. nov.; head; eyes indicated by *e, e, e* ($\times 99$).
15. " " " " left aspect of left antenna ($\times 127$).
16. " " " " ventral aspect of head ($\times 60$).
17. " " " " metanotal setæ ($\times 434$).
18. " " " " right aspect of left fore foot ($\times 367$).
19. *Anurida amorita* sp. nov.; eyes and postantennal organ of right side ($\times 200$).
20. *Anurida amorita* sp. nov.; left postantennal organ ($\times 434$).
21. " " " " right " " ($\times 434$). (figs. 20 and 21 are from the same individual.)
22. *Anurida amorita* sp. nov.; dorsal aspect of right antennal organ ($\times 367$).
23. *Anurida amorita* sp. nov.; left mid foot ($\times 200$).
24. " " " " right aspect of right fore foot ($\times 300$).

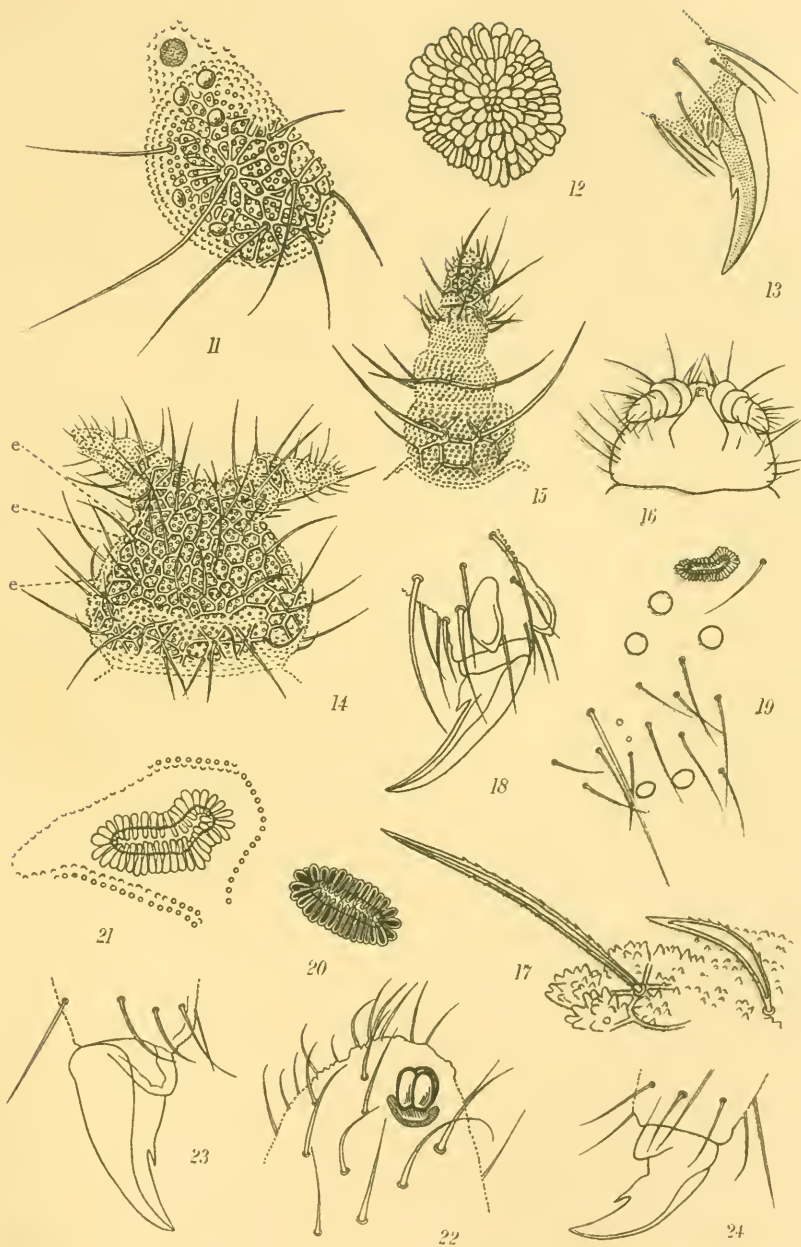




PLATE VII.

- FIG. 25. *Aphorura octopunctata* Tull.; right postantennal organ, etc. ($\times 367$).
 26. " " " " dorsal aspect of right antennal organ ($\times 434$).
 27. *Aphorura octopunctata* Tull.; left aspect of left hind foot ($\times 367$).
 28. " " " " left aspect of left anal spine ($\times 357$).
 29. " *dentata* sp. nov.; represents arrangement of dorsal pseudocelli ($\times 20$).
 30. *Aphorura dentata* sp. nov.; right postantennal organ ($\times 434$).
 31. " " " " deeper structure of postantennal organ ($\times 434$).
 32. *Aphorura dentata* sp. nov.; base of right antenna ($\times 127$).
 33. " " " " dorsal aspect of right antennal organ ($\times 434$).
 34. *Aphorura dentata* sp. nov.; left aspect of right hind foot ($\times 200$).
 35. " " " " dorsal aspect of anal spines ($\times 200$).
 36. " " " " right aspect of right anal spine ($\times 200$).
 37. *Isotoma fimetaria* (L.) Tull.; antenna ($\times 60$).
 38. " " " " left aspect of right hind foot ($\times 434$).
 39. " " " " left mucro ($\times 434$).
 40. " *viridis* Bourl., var. *arctica* Schött; eyes and postantennal organ of right side ($\times 200$).
 41. *Isotoma viridis* Bourl., var. *arctica* Schött; left aspect of left fore foot ($\times 200$).
 42. *Isotoma viridis* Bourl., var. *arctica* Schött; right aspect of right mucro ($\times 434$).

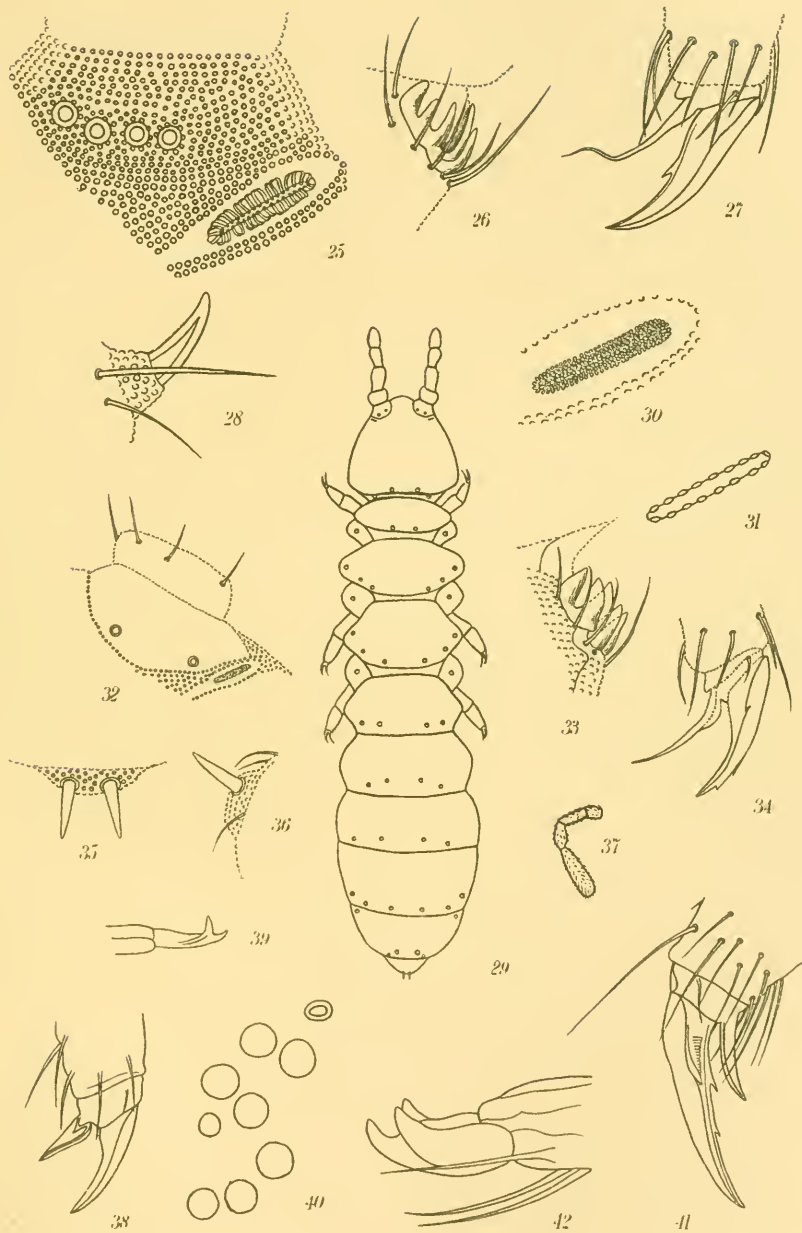
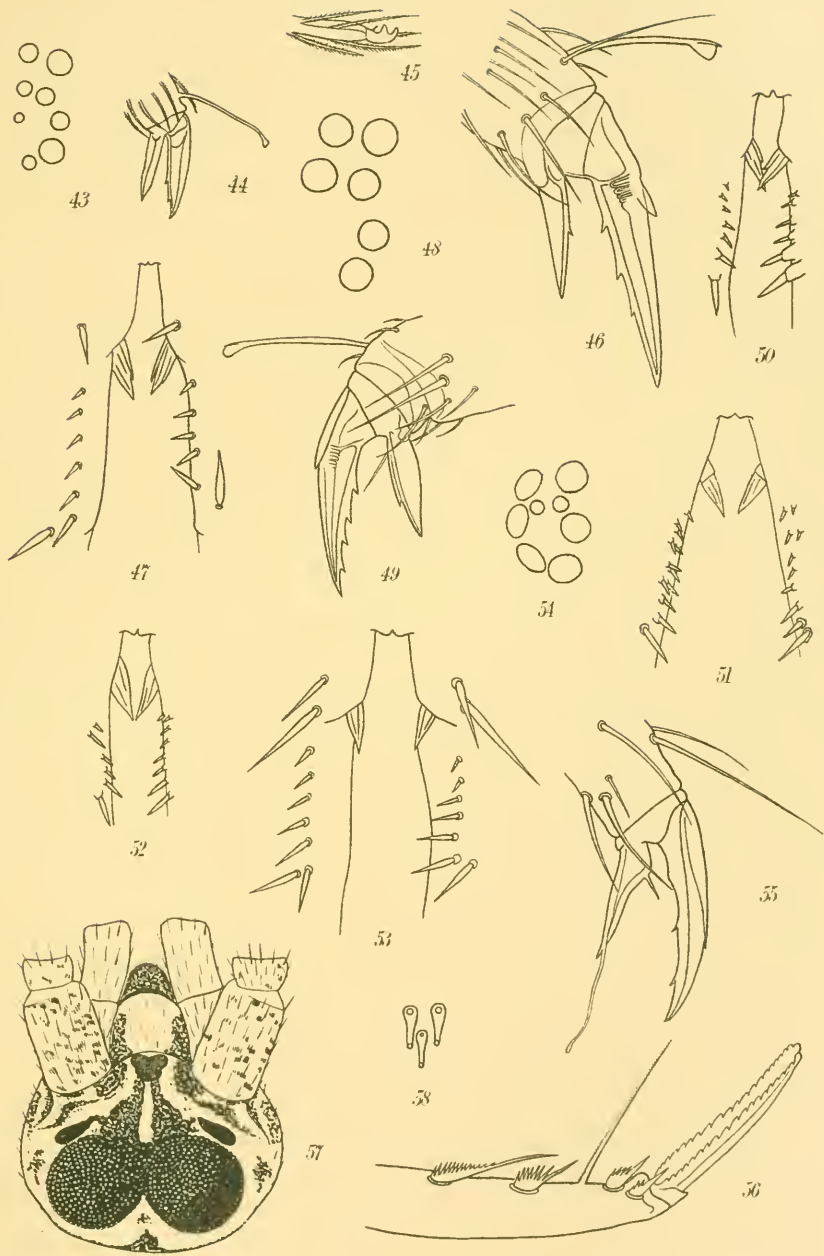


PLATE VIII.

- FIG. 43. *Entomobrya kincaidi* sp. nov.; eyes of right side ($\times 374$).
 44. " " " " left aspect of left hind foot ($\times 434$).
 45. " " " " left aspect of left mucro ($\times 434$).
 46. *Tomocerus niger* Bourl., type; right aspect of right fore foot ($\times 367$).
 47. " " " " dental spines ($\times 200$).
 48. " " " var. *arcticus* Schött; eyes of right side ($\times 367$).
 49. " " " " " " right aspect of left hind
 foot ($\times 367$).
 50. *Tomocerus niger* Bourl., var. *arcticus* Schött; dental spines ($\times 200$).
 51. " " " " " " doubled dental spines
 ($\times 200$).
 52. *Tomocerus niger* Bourl., var. *arcticus* Schött; dental spines slightly ab-
 normal ($\times 200$).
 53. *Tomocerus niger* Bourl., var. *americanus* Schött; dental spines ($\times 200$).
 54. *Papirius palmatus* sp. nov.; eyes of left side ($\times 127$).
 55. " " " " left aspect of left hind foot ($\times 367$).
 56. " " " " left aspect of left mucro, etc. ($\times 200$).
 57. *Machilis arctica* sp. nov.; dorsal aspect of head ($\times 28$).
 58. " " " " cuticular figure ($\times 434$).



PROCEEDINGS
OF THE
WASHINGTON ACADEMY OF SCIENCES

VOL. IV., PP. 117-274. [PLATES IX-XI.] MAY 29, 1902.

PAPERS FROM THE HARRIMAN ALASKA
EXPEDITION.

XXVIII.

HYMENOPTERA.

BY WILLIAM HARRIS ASHMEAD.

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CONTENTS:

| | |
|--------------------------------|-----|
| Introduction | 117 |
| Systematic account. | 123 |
| Heterophaga: | |
| I. Apoidea | 123 |
| II. Sphecoidea | 131 |
| III. Vespoidea | 134 |
| IV. Formicoidea | 135 |
| V. Proctotrypoidea | 136 |
| VI. Cynipoidea | 141 |
| VII. Chalcidoidea | 143 |
| VIII. Ichneumonoidea | 148 |
| Phytophaga: | |
| IX. Siricoidea | 253 |
| X. Tenthredinoidea | 254 |

INTRODUCTION.

ALASKA has long been a *terra incognita* to the Hymenopterologist. Up to the year 1899, the date of the Harriman Expedition, less than 30 species of Hymenoptera were known from this vast territory.

In this paper 335 species are recorded, of which number 201 are regarded as new to science and are here first described.

Of the 10 superfamilies, into which the order is now divided, all are represented in Alaska and are distributed into 29 families and 183 genera. Two of these genera, *Dallatorrca* and *Hyposyntactus* are new, and of the remainder, thirty have not been previously reported from North America.

This sudden and great increase of our knowledge in this field, in so short a time, is due mainly to the Harriman Expedition and to its indefatigable collector, Professor Trevor Kincaid.

The distribution of some of the species taken is most interesting. Four species, namely, *Lissonotus ruficoxis* Schmiedsknecht, *Triclistus curvator* Fabricius, *Alysia manducator* Panzer and *Ichneutes reunitor* Nees, are European, and three of them have not before been reported from North America. The last two mentioned are, however, widely distributed over Europe from the Arctic to the Mediterranean, and will doubtless be found to occur in Asia also. *Alysia manducator* is parasitic upon dipterous larvæ (*Muscidæ*), while *Ichneutes reunitor* destroys the willow saw-flies (*Nematidæ*).

Two bumble bees, *Bombus pleuralis* Nylander and *B. melanopygus* Nylander are Asiatic occurring in Siberia. *Bombus moderatus* Cresson is also recorded from Bering Island off the coast of Asia. Others of the bees taken occur in British Columbia, Hudson Bay Territory and in some parts of the northwestern States, *i. e.*, Washington, Oregon, California and Utah; only a few extend their range into the mountains of New Mexico, Idaho, and Colorado. A similar distribution is observed in some of the Sphecoidea and Vespoidea.

The ant, *Myrmica levinodis* Nylander is found in Europe and in Asia—Turkestan and Siberia; and another species, *Lasius niger* Linné, is found in Europe, northern Africa, Japan and Asia.

In the Ichneumonoidea and the Tenthredinoidea, many of the known species have a wide distribution throughout the Boreal Zone, *i. e.*, British Columbia, Canada and the northern United States. Very few are found in the Austral region and these occur principally in the Transition Zone; while still fewer are

known from the Upper Austral Zone, all being common species with a wide distribution, namely, *Metacælus lævis* Cr., *Ophion bilineatum* Say, *Enicospilus purgatus* Say, *Dolerus aprilis* Norton, etc.

The results of the collection in this order, made by the Harriman Expedition, are therefore most surprising considering that nearly all were taken in the coastal region, within the brief period of two months, between the first of June and the first of August. They fully demonstrate that this gold-bearing country is as rich in representatives of this order as any other similar region of boreal America; and they make it highly probable that when the interior of Alaska has been thoroughly exploited, a large majority of the species occurring in the Boreal Zone (British Columbia, Upper Canada and in the higher altitudes of the United States) will be found.

In this contribution towards the results of the Expedition I have also included, with the permission of Dr. C. Hart Merriam, editor of the papers of the expedition, all known Hymenoptera from Alaska and have incorporated all unstudied Alaskan material in the National Museum with the threefold object of (*a*) giving the results of the Harriman Expedition, (*b*) describing the new species in the National Museum, and (*c*) giving a complete list of Alaskan Hymenoptera, for the benefit of students and for the guidance of future expeditions, so that special efforts may be made to collect in families and genera not yet reported from Alaska.

I congratulate Mr. Harriman upon the splendid results obtained by his expedition and the National Museum in being made the depository of the rich collections made in the classes Insecta and Arachnida—the finest ever made in Alaska.

The arrangement of the families and genera is in accordance with the writer's views on the classification of these insects. All species not otherwise credited were received from the Harriman Expedition. It should also be noted that the specimens credited to the Fur Seal Commission, with few exceptions, were also collected by Professor Kincaid.

The following is a systematically arranged summary of the results:

TABULAR EXHIBIT SYSTEMATICALLY ARRANGED OF ALASKAN
HYMENOPTERA.

| Superfamilies. | Families. | Genera. | Number of Species. | | |
|----------------------|---------------------|----------------------|--------------------|------|--------|
| | | | Old. | New. | Total. |
| Apoidea | Bombidæ | Bombus | 12 | 5 | 17 |
| | Psithyridæ | Psithyrus | 1 | 1 | 2 |
| | Andrenidæ | Andrena | 1 | ... | 1 |
| Sphecoidea | Crabronidæ | Ectemnius | 1 | ... | 1 |
| | | Clytochrysus | 1 | ... | 1 |
| | | Thyreopus | 1 | ... | 1 |
| | | Blepharipus | 1 | ... | 1 |
| | | Dolichocrabro | ... | 1 | 1 |
| | Pemphredonidæ .. | Passalæcus | 1 | ... | 1 |
| | | Mimisa | 1 | ... | 1 |
| Vespoidea | Pompilidæ | Arachnophila | 1 | ... | 1 |
| | Vespidæ | Vespa | 2 | ... | 2 |
| | Eumenidæ | Odynerus | 1 | ... | 1 |
| | Chrysididæ | Omalus | 1 | ... | 1 |
| Formicoidea | Myrmicidæ | Myrmica | 3 | ... | 3 |
| | | Leptothorax | 1 | ... | 1 |
| | Formicidæ | Formica | 1 | ... | 1 |
| | | Lasius | 1 | ... | 1 |
| Proctotrypoidea. ... | Proctotrypidæ | Proctotrypes | ... | 1 | 1 |
| | | Zelotypa | ... | 3 | 3 |
| | Belytidæ | Aclista | 1 | ... | 1 |
| | | Zagota | 1 | ... | 1 |
| | | Spilomicrus | ... | 1 | 1 |
| | | Lygocerus | ... | 1 | 1 |
| Cynipoidea | Figitidæ | Tetrarhapta | ... | 1 | 1 |
| | | Eucoela | ... | 1 | 1 |
| | Diapriidæ | Alloxysta | ... | 1 | 1 |
| | | Lygocerus | ... | 1 | 1 |
| Chalcidoidea | Torymidæ | Torymus | 1 | ... | 1 |
| | Miscogasteridæ .. | Terobia | ... | 1 | 1 |
| | Pteromalidæ | Eutelus | ... | 1 | 1 |
| | Eulophidæ | Tetrastichus | ... | 2 | 2 |
| | | Elachistus | ... | 1 | 1 |
| Ichneumonoidea ... | Ichneumonidæ | Eulophus | ... | 1 | 1 |
| | | Automalus | ... | 1 | 1 |
| | | Stenichneumon | ... | 1 | 1 |
| | | Ichneumon | 3 | 7 | 10 |
| | | Melanichneumon .. | ... | 1 | 1 |
| | | Cratichneumon | ... | 5 | 5 |
| | | Probolus | ... | 1 | 1 |
| | | Platylabus | 2 | ... | 2 |
| | | Centeterus | ... | 1 | 1 |
| | | Eriplatys | ... | 1 | 1 |
| | | Xestophya | ... | 2 | 2 |
| | | Asynocrita | 1 | ... | 1 |
| | | Exolytus | 1 | 11 | 12 |
| | | Atractodes | ... | 1 | 1 |
| | | Stibeutes | 1 | ... | 1 |
| | | Stiboscopus | ... | 6 | 6 |
| | | Bathymetis | ... | 11 | 11 |
| | | Plectrocryptus | ... | 2 | 2 |
| | | Microcryptus | ... | 2 | 2 |
| | | Plesiognathus | ... | 1 | 1 |
| | | Hedylus | 2 | ... | ... |
| | | Bachia | 1 | ... | 1 |

TABULAR EXHIBIT SYSTEMATICALLY ARRANGED OF ALASKAN
HYMENOPTERA.—*Continued.*

| Superfamilies. | Families. | Genera. | Number of Species. | | |
|--------------------|-------------------|---------------------|--------------------|------|--------|
| | | | Old. | New. | Total. |
| Ichneumonoidea ... | Ichneumonidæ | Spinolia | ... | 1 | 1 |
| | | Acrolyta | ... | 2 | 2 |
| | | Thestis | ... | 1 | 1 |
| | | Aclastus | ... | 1 | 1 |
| | | Habromma | ... | 1 | 1 |
| | | Algina..... | ... | 1 | 1 |
| | | Ænoplex | ... | 1 | 1 |
| | | Philonygus..... | ... | 2 | 2 |
| | | Ilapinastes..... | ... | 1 | 1 |
| | | Isochresta..... | ... | 1 | 1 |
| | | Thaumatotypus.... | 1 | ... | 1 |
| | | Theroscopus | ... | 3 | 3 |
| | | Pezomachus..... | 1 | 2 | 3 |
| | | Cryptoideus..... | ... | 1 | 1 |
| | | Himertosoma | ... | 1 | 1 |
| | | Lampronota..... | 1 | ... | 1 |
| | | Phytodietus | ... | 2 | 2 |
| | | Trevoria | ... | 1 | 1 |
| | | Lissonota | 1 | 1 | 2 |
| | | Pimplopterus..... | ... | 2 | 2 |
| | | Harrimaniella | ... | 1 | 1 |
| | | Ecthrodoca | 2 | 1 | 3 |
| | | Rhyssa | ... | 1 | 1 |
| | | Pimpla..... | ... | 1 | 1 |
| | | Epiurus | ... | 2 | 2 |
| | | Glypta..... | ... | 2 | 2 |
| | | Holcostizus | 1 | ... | 1 |
| | | Odontomerus..... | 1 | ... | 1 |
| | | Cubocephalus..... | ... | 3 | 3 |
| | | Xylonomus..... | 1 | ... | 1 |
| | | Spanoctecnus..... | ... | 1 | 1 |
| | | Dallatorrea | ... | 1 | 1 |
| | | Hypocryptus | ... | 5 | 5 |
| | | Mesoleptus..... | ... | 1 | 1 |
| | | Microplectus..... | ... | 1 | 1 |
| | | Cteniscus | 1 | 1 | 2 |
| | | Diaborus..... | ... | 2 | 2 |
| | | Erromenus | ... | 1 | 1 |
| | | Monoblastus | ... | 1 | 1 |
| | | Polyblastus | ... | 1 | 1 |
| | | Scorpiorus | ... | 2 | 2 |
| | | Trematopygus..... | ... | 1 | 1 |
| | | Cosmoconus | 1 | ... | 1 |
| | | Tryphon..... | ... | 1 | 1 |
| | | Tryphoctonus..... | ... | 1 | 1 |
| | | Sychnoportus | ... | 1 | 1 |
| | | Tlemon..... | ... | 1 | 1 |
| | | Polyterus | ... | 1 | 1 |
| | | Hyposyntactus..... | ... | 1 | 1 |
| | | Calliphurur | ... | 10 | 10 |
| | | Gemophaga | ... | 1 | 1 |
| | | Mesoleius | 2 | ... | 2 |
| | | Bassus | 1 | ... | 1 |
| | | Promethes | ... | 1 | 1 |

Note: New genera in black face type.

TABULAR EXHIBIT SYSTEMATICALLY ARRANGED OF ALASKAN
HYMENOPTERA.—*Continued.*

| Superfamilies. | Families. | Genera. | Number of Species. | | |
|---------------------|-------------------|---------------------|--------------------|------|--------|
| | | | Old. | New. | Total. |
| Ichneumonoidea ... | Ichneumonidæ | Bioblapsis..... | ... | 1 | 1 |
| | | Zootrepbes | ... | 1 | 1 |
| | | Phthorina | ... | 1 | 1 |
| | | Enizemon | 1 | ... | 1 |
| | | Homotropus | ... | 2 | 2 |
| | | Synoplus | ... | 2 | 2 |
| | | Hypoleptus | ... | 2 | 2 |
| | | Neuroteles | ... | 1 | 1 |
| | | Deleter | ... | 2 | 2 |
| | | Tapinops..... | 1 | ... | 1 |
| | | Atmetus | 1 | ... | 1 |
| | | Orthocentrus..... | ... | 1 | 1 |
| | | Phænosemus..... | ... | 1 | 1 |
| | | Stenomacrus..... | 1 | ... | 1 |
| | | Camarotops | ... | 1 | 1 |
| | | Triclistus | 1 | ... | 1 |
| | | Metacælus | 1 | ... | 1 |
| | | Ophion | 1 | ... | 1 |
| | | Enicospelus | 1 | ... | 1 |
| | | Atrometus | ... | 1 | 1 |
| | | Campoplex..... | 1 | ... | 1 |
| | | Zachresta | ... | 2 | 2 |
| | | Phædroctonus..... | ... | 1 | 1 |
| | | Olesicampa | ... | 1 | 1 |
| | | Hypotherutes | ... | 1 | 1 |
| | | Ischnoscopus | ... | 1 | 1 |
| | | Limnerium..... | ... | 1 | 1 |
| | | Ameloctonus..... | ... | 1 | 1 |
| | | Paniscus..... | ... | 1 | 1 |
| | | Mesochorus | 1 | 2 | 3 |
| | | Isurgus | ... | 1 | 1 |
| | | Catastenus..... | 1 | 1 | 2 |
| | | Plectiscus..... | ... | 1 | 1 |
| | Alysiidæ..... | Alysia | 1 | ... | 1 |
| | | Anarcha | ... | 1 | 1 |
| | | Delocarpa..... | ... | 1 | 1 |
| | | Rhizarcha | ... | 1 | 1 |
| | | Gyrocampa..... | ... | 1 | 1 |
| | Braconidæ | Liposcia | ... | 1 | 1 |
| | | Praon | ... | 1 | 1 |
| | | Aphidius..... | ... | 4 | 4 |
| | | Dyscoletes..... | ... | 1 | 1 |
| | | Chelonus | 1 | ... | 1 |
| | | Protapanteles | ... | 3 | 3 |
| | | Apanteles..... | ... | 1 | 1 |
| | | Microplitis..... | ... | 1 | 1 |
| | | Ichneutes..... | 1 | 2 | 3 |
| | | Desmiostoma..... | ... | 1 | 1 |
| | | Macrodyctium..... | ... | 1 | 1 |
| | | Exothecus..... | ... | 1 | 1 |
| | | Rhogas | ... | 1 | 1 |
| | | Sirex | 1 | ... | 1 |
| | | Itycorsia..... | 1 | ... | 1 |
| Siricoidea..... | Siricidæ..... | Cephaleia..... | 2 | ... | 2 |
| Tenthredinoidea.... | Lydidæ | | | | |

TABULAR EXHIBIT SYSTEMATICALLY ARRANGED OF ALASKAN
HYMENOPTERA.—*Continued.*

| Superfamilies. | Families. | Genera. | Number of Species. | | |
|---------------------|--------------------|---------------------|--------------------|------|--------|
| | | | Old. | New. | Total. |
| Tenthredinoidea ... | Lydidæ | Batroceros | ... | 1 | 1 |
| | Selandriidæ | Fenusa..... | 1 | ... | 1 |
| | | Erythraspides | 1 | ... | 1 |
| | | Monophadnus | 1 | ... | 1 |
| | | Paraselandria..... | 1 | ... | 1 |
| | | Pæcilostomidea .. | 1 | ... | 1 |
| | Nematidæ | Pachynematus..... | 6 | ... | 6 |
| | | Nematus..... | 2 | ... | 2 |
| | | Pristiphora..... | 6 | ... | 6 |
| | | Euura | 1 | ... | 1 |
| | | Pontania..... | 8 | ... | 8 |
| | | Pteronus..... | 3 | ... | 3 |
| | | Amauronematus... | 1 | ... | 1 |
| | Tenthredinidæ | Dolerus..... | 4 | ... | 4 |
| | | Emphytus..... | 1 | ... | 1 |
| | | Pachyprotasis | 1 | ... | 1 |
| | | Macrophya..... | 2 | ... | 2 |
| | | Tenthredo..... | 3 | ... | 13 |
| | | Allanthus..... | 1 | ... | 1 |
| | Cimbicidæ | Cimbex..... | 1 | ... | 1 |
| | | Trichiosoma..... | 2 | ... | 2 |
| | Total | 134 | 201 | 335 | |

Thus it appears that 10 superfamilies, 29 families, 183 genera (2 being new) and 335 species (201 being new) are now known from Alaska.

SYSTEMATIC ACCOUNT.

Suborder **HETEROPHAGA** Ashmead.

Superfamily I. **APOIDEA** Ashmead.

Family **BOMBIDÆ**.

Genus **Bombus** Latreille.

BOMBUS MODERATUS Cresson.

Bombus modestus CRESSON, Proc. Ent. Soc. Phil., II, p. 99, ♀ (nec *modestus* Smith), 1863.

Bombus moderatus CRESSON, Proc. Ent. Soc. Phil., II, p. 109, 1863.—CRESSON, Syn. Hym. North America, p. 308, 1887.—ASHMEAD, Fur Seals and Fur Seal Islands, IV, p. 336, 1899.

Bombus terricola var. *modestus* HANDLIRSCH, Ann. Hofmus. Wien, III, p. 234, 1888. DALLA TORRE, Cat. Hym., x, p. 558, 1896.

Type in collection of the American Entomological Society. From Kodiak, July 20. One female, six workers.

I cannot agree with Herr Handlirsch, of the Hofmuseum, Vienna, Austria, who has reduced this species to a variety of *B. terricola* Kirby, with which it is not even closely allied.

BOMBUS CALIFORNICUS Smith.

Bombus californicus SMITH, Cat. Hym. Brit. Mus., II, p. 400, ♀♂, 1854.—CRESSON, Proc. Ent. Soc. Phil., II, p. 97, ♂♀, 1863.—CRESSON, Trans. Am. Ent. Soc., VII, p. 230, 1879.—CRESSON, Syn. Hym. North America, p. 307, 1887.—HANDLIRSCH, Ann. Hofmus. Wien, III, p. 243, 1888.—DALLA TORRE, Cat. Hym., X, p. 513, 1896.

Bombus vosnesenski RADOSZKOWSKI. Bull. Soc. Nat. Moscou, XXXV, p. 589, T. 6, f. 2, 1863.

Bombus flavifrons SMITH, Lord's Naturalist in Vanc. Isl., II, p. 34, 1866.

Bombus columbicus DALLA TORRE, Cat. Hym. Wien. Ent. Zeitg., IX, p. 139, 1890.

Type in British Museum. From Sitka (*teste* Handlirsch).

BOMBUS NEVADENSIS Cresson.

Bombus pennsylvanicus CRESSON, Proc. Ent. Soc. Phila., II, p. 94, ♂ (*nec* De Geer), 1863.

Bombus nevadensis CRESSON, Trans. Am. Ent. Soc., V, p. 102, ♀♂ 1874.—CRESSON, Rep. Geogr. & Geol. Surv. 100th merid., V, p. 728, Pl. 34, f. 5, 1875.—CRESSON, Syn. Hym. North Am., p. 308, 1887.—HANDLIRSCH, Ann. Hofmus. Wien, III, p. 245, T. 10, f. 3, II, 1888.—DALLA TORRE, Cat. Hym., X, p. 538, 1896.

Type in collection of the American Entomological Society. From Alaska (U. S. Coast and Geodetic Survey), Nevada, Utah, Colorado.

BOMBUS PROXIMUS Cresson.

Bombus proximus CRESSON, Proc. Ent. Soc. Phila., II, p. 98, ♀, 1863.

Bombus howardii var. *proximus* CRESSON, Trans. Am. Ent. Soc., VII, p. 231, 1879.—CRESSON, Syn. Hym. North Am., p. 308, 1887.

Bombus terricola var. *proximus* HANDLIRSCH, Ann. Hofmus. Wien, III, p. 234, 1888.—DALLA TORRE, Cat. Hym., X, p. 559, 1896.

Type in collection of the American Entomological Society. From Alaska (U. S. Coast and Geodetic Survey).

BOMBUS NEGLECTULUS sp. nov.

Female.—Length 17 mm. Black and clothed with a black pubescence, except as follows: The anterior portion of the thorax above, and a small spot just in front of the tegulæ are clothed with a pale yellowish pubescence; the scutellum has two tufts of yellowish pubescence but mixed with black hairs on their inner margins, while the third dorsal abdominal segment at apex and *laterally*, and the fourth entirely are clothed with a fulvo-rufous pubescence.

The head is clothed with a black pubescence; the malar space is long, nearly one-half the length of the eyes; the second joint of the flagellum is much shorter than the first, or the third, and scarcely longer than thick; while the wings are blackish fuscous, the tegulae piceous, impunctate.

Worker.—Length 13 mm. Agrees well with the female in color, except that the head has a tuft of yellowish hairs on the vertex and on the face, while the mesopleura are also yellowish. The fulvo-rufous pubescence on abdominal segments 3 and 4 is confined entirely to the lateral margins, the median portion of the segments being bare and shining, while the fifth segment also has a small tuft of fulvo-rufous hairs at its extreme lateral margins.

Male.—Unknown.

Type.—Cat. No. 5718, U. S. Nat. Museum. From Alaska (U. S. Coast and Geodetic Survey).

In the collection of the American Entomological Society is a single worker agreeing well with the female, except in its smaller size, and labelled *Bombus howardii* Cresson, Silver Lake, Utah, July 16.

This species comes evidently nearest to *B. medius* Cresson and *B. dubius* Cresson, but is easily separated from both by the difference in the color of the scutellum and abdomen, and by the longer malar space.

BOMBUS MCKAYI sp. nov.

Female.—Length 19 mm. Black, clothed with a black pubescence, the middle of the face below the antennae, thorax above anteriorly, scutellum posteriorly and the third, fifth and sixth dorsal segments of abdomen clothed with a pale yellowish-white pubescence, the black pubescence of the second segment overlaps the base of the third and the black pubescence of the fourth segment overlaps the base of the fifth or the hairs are white at apex.

The head seen from in front, is a little longer than wide, the malar space being distinct, rather long, as long as the pedicel and first joint of the flagellum united; the forehead, between the ocelli and base of the antennae is distinctly punctate; the ocelli are pale and arranged almost in a straight line; while the wings are fuscous with the tegulae and the veins black. Legs black, with a small spot of hairs at apex of front and middle tibiae before and behind, and the hind tibiae before and behind fringed with fulvous hairs. The antennae are broken off at tips but the joints of the flagellum remaining are as follows: The first joint is the longest, obconical, a little longer than the third or fourth, which are equal in length and a little longer than the second.

Type.—Cat. No. 5719, U. S. Nat. Museum. From Nushagak River (Chas. W. McKay). Received through U. S. Dept. Agric.

BOMBUS COUPERI Cresson.

Bombus couperi CRESSON, Proc. Acad. Nat. Sci. Phila., p. 185, ♀, 1878.—CRESSON, Syn. Hym. North Am., p. 307, 1887.—DALLA TORRE, Cat. Hym., x, p. 515, 1896.

Type in collection of the American Entomological Society. Popof Island, July 2, 4; Seldovia, July 7; Nushagak River (Chas. W. McKay). All sexes are represented.

BOMBUS OREGONENSIS Cresson.

Bombus oregonensis CRESSON, Proc. Acad. Nat. Sci. Phila., p. 185, ♂, 1878.—CRESSON, Syn. Hym. North Am., p. 308, 1887.—DALLA TORRE, Cat. Hym., x, p. 538, 1896.

Type in collection of the American Entomological Society. Fox Point, July 20; Kodiak, July 20; Juneau, July 25; Seldovia, July 26; Popof Island, July 4.

BOMBUS FRIGIDUS Smith.

Bombus frigidus SMITH, Cat. Hym. Brit. Mus., II, p. 399, ♀ ♂, 1854.—CRESSON, Proc. Ent. Soc. Phila., II, p. 100, ♀ ♂, 1863.—PROVANCHER, Add. Fn. du Can. Hym., p. 341.—DALLA TORRE, Cat. Hym., x, p. 521, 1896.

Bombus carrei GREENE, Ann. Lyc. Nat. Hist. New York, VII, p. 170, 1860.

Type in British Museum. From Kukak Bay, July 4.

This species is found in Arctic America, Hudson Bay Territory, throughout British Columbia to Vancouver Island and in some high altitudes in the United States—mountains of Colorado and New Mexico.

BOMBUS SITKENSIS Nylander.

Bombus sitkensis NYLANDER, Notis Saellsk. faun. et fl. Fenn. Förh., I [Adnot.], p. 235, ♀ ♂, 1848.—CRESSON, Proc. Ent. Soc. Phila., II, p. 102, ♀ ♂, 1863.—DALLA TORRE, Ber. naturw. mediz., Ver. Innsbr., XII, p. 11, ♂, 1882.—CRESSON, Syn. Hym. North Am., p. 309, 1887.—HANDLIRSCH, Ann. Hofmus. Wien, III, p. 232, 1888.—DALLA TORRE, Cat. Hym., x, p. 549, 1896.—ASHMEAD, Fur Seals and Fur Seal Islands IV, p. 336, 1899.

Bombus prunellæ COCKERELL, Ann. & Mag. Nat. Hist. (7), VI, p. 391, 1899.

Kukak Bay, July 4. Siberia: Bering Island (Dr. L. Stejneger); Copper Island (Barrett-Hamilton). New Mexico (T. D. A. Cockerell); White Mts.

BOMBUS NEARTICUS Handlirsch.

Bombus nearticus HANDLIRSCH, Ann. Hofmus. Wien., III, p. 243, ♀ ♂ ♂, 1888.

Type in Hofmuseum, Vienna. From Juneau, July 25; Wrangell (H. F. Wickham). Occurs also in Canada, Idaho and California.

BOMBUS GELIDUS Cresson.

Bombus gelidus CRESSON, Proc. Acad. Nat. Sci. Phila., p. 184, ♀, 1878.

Bombus melanopygus HANDLIRSCH (*nec* Nylander), Ann. Hofmus. Wien, III, p. 231, 1888.—DALLA TORRE, Cat. Hym., X, p. 533, 1896.

Bombus kincaidii COCKERELL, Ann. & Mag. Nat. Hist. (7), II, p. 324, ♀ ♂ ♂, 1898.

Type in collection of the American Entomological Society.

From Aleutian Islands (Cresson); Pribilof Islands (Kincaid). Dr. Henry Skinner has kindly sent me the type of this species for examination, and Professor Cockerell's *B. kincaidii* proves to be identical with it.

BOMBUS POLARIS Curtis.

Bombus polaris CURTIS, Ross's 2d Voy., App., p. lxiii, ♀ ♂, 1831.—ERICHSON, Arch. f. Naturg., I, p. 288, 1836.—SMITH, Cat. Hym. Brit. Mus., II, p. 397, ♀, 1854.—CRESSON, Proc. Ent. Soc. Phila., II, p. 101, 1863.—MACLACHLAN, Journ. Linn. Soc. Zool., XIV, p. 106, 1877.—DALLA TORRE, Cat. Hym., X, p. 540, 1896.

Type in British Museum. From Kodiak, July 20; Seldovia, July 25.

BOMBUS PLEURALIS Nylander.

Bombus pleuralis NYLANDER, Notis. Saellsk faun. et fl. Fenn. Förh., I [Adnot.] p. 231, ♀ ♂, 1848.—CRESSON, Proc. Ent. Soc. Phila., II, p. 96, ♀ ♂, 1863.—DALLA TORRE, Cat. Hym., X, p. 540, 1896.

From Popof Island, July 8, 9, 11; Kodiak, July 20. Also found in Siberia.

BOMBUS SYLVICOLA Kirby.

Bombus sylvicola KIRBY, Faun. Bor.-Amer., IV p. 272, 1837.—CRESSON, Proc. Ent. Soc. Phila., II, p. 106, ♀, 1863.—CRESSON, Syn. Hym. North Am., p. 309, 1887.—DALLA TORRE, Cat. Hym., X, p. 548, 1896.

Bombus gelidus COCKERELL (*nec* CRESSON).

Type in British Museum. From Kukak Bay, July 4; Popof Island, July 9; Seldovia, July 21; Unalaska, August 27.

BOMBUS JXTUS Cresson.

Bombus jxtus CRESSON, Proc. Acad. Nat. Sci. Phila., p. 187, ♀, 1878.—CRESSON, Syn. Hym. North Am., p. 308, 1887.

Bombus flavifrons HANDLIRSCH (*nec* Cresson) Ann. Hofmus. Wien, III, p. 231, 1888.—DALLA TORRE, Cat. Hym., X, p. 520, 1891.

Bombus parvulus COCKERELL.

Type in collection of the American Entomological Society. From Kukak Bay, July 4; Matlakatla; Nushagak River (Chas. W. McKay); Wrangell (H. F. Wickham).

BOMBUS MELANOPYGUS Nylander.

Bombus melanopyge NYLANDER, Notis. Saellsk. faun. et fl. Fenn. Förh. 1 [Adnot.], p. 236, ♀, 1848.—CRESSON, Proc. Ent. Soc. Phila., 11, p. 103, 1863.—CRESSON, Syn. Hym. North Am., p. 308, 1887.

Bombus menestriesii RADOSKOWSKI, Bull. Soc. Natur. Moscou, xxxii, p. 843, ♂ ♀, Pl. 5, f. 6, 1859.

Bombus melanopygus HANDLIRSCH, Ann. Hofmus. Wien, III, p. 251, 1888.—DALLA TORRE, Cat. Hym., x, p. 533, 1896.

Bombus lacustris CRESSON, Proc. Ent. Soc. Phila., 11, p. 103, 1863.—CRESSON, Syn. Hym. North Am., p. 308, 1887.—PROVANCHER, Add. Fn. Hym., p. 340, 1888.

? *Bombus ternarius* var. *lacustris* HANDLIRSCH, Ann. Hofmus. Wien, III, p. 251, 1888.—DALLA TORRE, Cat. Hym., x, p. 533, 1896.

Type of *lacustris* Cresson, in collection of the American Entomological Society. From Berg Bay, June 10; Juneau, June 7, July 25; Kodiak, July 20; Seldovia, July 21; Wrangell (H. F. Wickham); Seward Peninsula (W. J. Peters); Sitka (Fur Seal Commission).

This species is also common in Vancouver Island, B. C.

The type of *Bombus lacustris* Cresson was submitted to me for examination, together with other of Cresson's types of bumble bees, by Dr. Henry Skinner, Curator of the American Entomological Society, and it is undoubtedly identical with the above species. What Handlirsch describes as *Bombus ternarius* var. *lacustris* is probably a different species.

BOMBUS ALASKENSIS sp. nov.

Female.—Length 17 mm. Resembles *B. melanopygus* Nylander, very closely and with the color of the pubescence almost identical, except that the scutellum is more grayish and the first and second dorsal abdominal segments are clothed with a yellowish pubescence, the third and fourth red or fulvo-rufous, the fifth and sixth black.

Worker.—Length 12 to 13 mm. Colored as in female and practically the same except in being much smaller.

Male.—Unknown.

Type.—Cat. No. 5720, U. S. Nat. Museum. From Sitka, June 16; Fox Point, July 20.

BOMBUS MIXTUOSUS, sp. nov.

Female.—Length 14 mm. Mesopleura and dorsal abdominal seg-

ments 1 and 2 clothed with a yellowish pubescence, that on the two basal segments is very sparse or interrupted medially; the last three abdominal segments with very sparse, pale yellowish hairs; thorax above medially and on the scutellum with a grayish pubescence, the anterior part of the thorax with yellow hairs well intermixed with black, very much as in *B. melanopygus* Nylander; dorsal abdominal segments 3 and 4 with a black pubescence but usually (though not invariably) interrupted by a narrow fringe of yellowish hairs extending from the apex of the second; ventral segments fringed with a sparse pale pubescence; face with a yellowish pubescence more or less mixed with black hairs; legs with a long yellowish hair fringe, that on the femora *beneath* is usually mixed more or less, with black hairs. Malar space a little longer than wide. First joint of flagellum a little longer than the third, the second hardly longer than thick and only about two-thirds the length of the third.

Worker.—Length (major) 12 mm.; (minor) 7.5 to 10 mm. Both colored as in female, except that the pubescence on the face in the worker minor is black or with only a few whitish hairs intermixed with the black.

Male.—Unknown.

Type.—Cat. No. 5721, U. S. Nat. Museum. From Popof Island, June 21; Yakutat, June 21; Virgin Bay, June 21; Fox Point, July 20.

BOMBUS DIMIDIATUS sp. nov.

Female.—Length 12 mm. Mesopleura, the anterior part of the thorax above, the apex of scutellum and the dorsal abdominal segments 1 and 2 clothed with a pale yellowish pubescence that on the pleura is nearly white, on the anterior part of the thorax and the scutellum mixed with black hairs on dorsal segments 1 and 2 interrupted by a bare space medially; otherwise, except some pale hairs on the middle of the face and the apical fringe on the ventral segments, the pubescence is black. Wings fuscous. Malar space about one-third the length of the eye. First joint of flagellum nearly as long as 2 and 3 united, the second shorter than the third, not longer than wide. Occasionally the black hairs on the apex of the third and fourth dorsal segments of abdomen are well mixed with fulvo-rufous hairs, having the appearance of two red lines across the black pubescence.

Worker.—Length 9 mm. Agrees in color with the female (or? worker major), except that the face is usually black or with only a small tuft of pale hairs between and extending below the insertion of the antennæ.

Male.—Unknown.

Type.—Cat. No. 5722, U. S. Nat. Museum. From Fox Point, July 28; Wrangell (H. F. Wickham).

The female described above may really be the worker major, for many of our bumble bees have two forms of workers—a worker *major* and a worker *minor*.

Family PSITHYRIDÆ.

Genus *Psithyrus* Lepeletier.

PSITHYRUS INSULARIS (Smith).

? *Bombus interruptus* GREENE, Ann. Lyc. Nat. Hist. New York, VII, p. 11, ♀, 1858.—GREENE, op. cit., VII, p. 193, 1860.

? *Bombus suckleyi* GREENE, Ann. Lyc. Nat. Hist. New York, VII, p. 173, ♂, 1860.

Apathus insularis SMITH, Journ. Ent., I, p. 155, ♀, 1861.—CRESSON, Proc. Ent. Soc. Phila., II, p. 113, ♀♂, 1863.—PROVANCHER, Add. Fn. du Can. Hym., p. 343, ♀♂, 1888.

Psithyrus insularis HANDLIRSCH, Ann. Hofmus. Wien, III, p. 248, 1888.

Psithyrus interruptus DALLA TORRE, Cat. Hym., X, p. 569, 1896.

Type in British Museum. From Berg Bay, June 10; Sitka, July 16; Juneau, July 25; Seldovia, July 7; and Nushagak River, July 27, 1881 (Chas. W. McKay).

PSITHYRUS KODIAKENSIS sp. nov.

(Pl. IX, fig. 1.)

Male.—Length 14 mm. The tegument of this species, except the disk of the mesonotum and the base of the scutellum where the pubescence is thin, and the first and second segments of the abdomen, which are brown, is entirely black. The head, except a tuft of ochraceous pubescence on the face below the insertion of the antennæ and on the vertex posteriorly, is clothed with a black pubescence; thorax above and at sides, dorsal abdominal segments 1 and 2, the venter and the legs clothed with a rather long ochraceous pubescence; dorsal abdominal segments 2 to 7 with a black pubescence and in striking contrast with the ochraceous pubescence of the basal segments.

The head seen from in front is much longer than wide, the malar space long, smooth and shining and fully as long as the pedicel and first two joints of the flagellum united; the clypeus, except anteriorly, is punctate; the labrum is feebly transversely impressed, sparsely punctate, except the lateral hind angles, which are polished and impunctate; the first joint of the flagellum is shorter than the third but longer than

the second, the latter being only about two-fifths the length of the third and the shortest joint, while the last joint is compressed and a little shorter than the third.

Type.—Cat. No. 5723, U. S. Nat. Museum. From Kodiak, July 20. Two specimens.

Family ANDRENIDÆ.

Genus *Andrena* Latreille.

ANDRENA FRIGIDA Smith.

Andrena frigida SMITH, Cat. Hym. Brit. Mus., 1, p. 115, ♀, 1853.—PROVANCHER, Nat. Can., XIII, p. 195, 1882.—PROVANCHER, Fn. ent. du Can. Hym., p. 795, 1883.—CRESSON, Syn. Hym. North Am., p. 293, 1887.—DALLA TORRE, Cat. Hym., x, p. 125, 1896.

Male.—Length 8 mm. Black, clothed with a long sparse whitish pubescence; tarsi with a dark rufo-piceous tinge beneath; mandibles long, decussate and with a prominent process beneath at base, head transverse wider than the thorax, viewed from above obtuse, the occiput rather broadly concave, the temple much broadened below and, as seen from the side, forming an acute angle with the base of the mandibles; malar space very short; face rather closely punctate, the vertex between the eyes and the lateral ocelli and towards the base of the antennæ longitudinally aciculate, the temples shining although faintly coriaceous; thorax above opaque, alutaceous, impunctate; metathorax finely coriaceous without vestige of carinæ. Wings hyaline, the stigma and veins brown, the tegulæ piceous. Abdomen long oval, a little longer than the head and thorax united, apparently smooth and shining, but with a strong lens exhibiting numerous microscopic transverse lineations, the first and second dorsal segments clothed with long whitish hairs, the hairs on the following segments sparser and confined more particularly to the lateral margins.

Type *female* in British Museum, *male* in U. S. Nat. Museum. From Muir Inlet, June 11; Sitka, June 16.

Superfamily II. SPHECOIDEA Ashmead.

Family CRABRONIDÆ.

Subfamily CRABRONINÆ.

Genus *Ectemnius* Dahlbom.

ECTEMNIUS PARVULUS (Packard).

Crabro parvulus PACKARD, Proc. Ent. Soc. Phila., VI, p. 108, ♀, 1867.—CRESSON, Syn. Hym. North Am., p. 285, 1887.—FOX, Trans. Am. Ent.

- Soc., XXII, p. 142, ♀♂, 1895.—DALLA TORRE, Cat. Hym., VIII, p. 616, 1896.
Ectemnius parvulus ASHMEAD, Can. Ent., XXXI, p. 173, 1899.—KINCAID, Proc. Wash. Acad. Sci., II, p. 508, 1900.

From Seldovia, July 21. The species is also found in Washington, Oregon, Nevada, South Dakota and Colorado.

Genus *Clytochrysus* Morawitz.

CLYTOCHRYsus GRACILISSIMUS (Packard).

- Crabro contiguus* CRESSON, Proc. Ent. Soc. Phila., IV, p. 484, ♂ (nec ♀), 1865.
Crabro gracilissimus PACKARD, Proc. Ent. Soc. Phila., VI, p. 78, ♂, 1867.—CRESSON, Syn. Hym. North Am., p. 285, 1887.—FOX, Trans. Am. Ent. Soc., XXII, p. 144, ♀♂, 1895.—DALLA TORRE, Cat. Hym., VIII, p. 603, 1897.
Clytochrysus gracilissimus ASHMEAD, Can. Ent., XXXI, p. 174, 1899.—KINCAID, Proc. Wash. Acad. Sci., II, p. 508, 1900.

From Fox Point, July 28. Occurs also in Colorado.

Subfamily *THYREOPINÆ*.

Genus *Thyreopus* Latreille.

THYREOPUS VICINUS (Cresson).

- Crabro vicinus* CRESSON, Proc. Ent. Soc. Phila., IV, p. 479, ♀, 1865.—FOX, Trans. Am. Ent. Soc., XXII, p. 170, ♀♂, 1895.—DALLA TORRE, Cat. Hym., VIII, p. 636, 1897.
Crabro succinctus CRESSON, Proc. Ent. Soc. Phila., IV, p. 479, ♂, 1865.
Thyreopus succinctus CRESSON, Syn. Hym. North Am., p. 287, 1887.
Thyreopus vicinus ASHMEAD, Can. Ent., XXXI, p. 217, 1899.—KINCAID, Proc. Wash. Acad. Sci., II, p. 508, 1900.

Type in collection of the American Entomological Society. From Kukak Bay, July 4. Occurs also in Colorado.

Genus *Blepharipus* Lepeletier et Brullé.

BLEPHARIPUS ATER (Cresson).

- Crabro ater* CRESSON, Proc. Ent. Soc. Phila., IV, p. 477, ♀, 1865; Syn. Hym. North Am., p. 284, 1887.—FOX, Trans. Am. Ent. Soc., XXII, p. 197, ♀♂, 1895.—DALLA TORRE, Cat. Hym., VIII, p. 583, 1897.
Blepharipus ater PACKARD, Proc. Ent. Soc. Phila., VI, p. 374, 1867.—PROVANCHER, Nat. Can., XIII, p. 133, 1882.—PROVANCHER, Fn. ent. du Can. Hym., VIII, p. 667, 1883.—ASHMEAD, Can. Ent., XXXI, p. 217, 1899.—KINCAID, Proc. Wash. Acad. Sci., II, p. 508, 1900.

Type in collection of the American Entomological Society. From Seldovia, July 28. Occurs also in Canada and Colorado.

Genus **Dolichocrabro** Ashmead.**DOLICHOCRABRO WICKHAMI** sp. nov.

Male.—Length 6.5 to 7 mm. Form elongated and narrowed; black and shining; antennal tubercles, a line on front femora and the tarsi, except the last joint, rufo-piceous; tibial spurs whitish; clypeus anteriorly obtusely triangular and clothed with a dense silvery pubescence; flagellum with a fringe of short white hairs beneath; ocelli honey-yellow.

The head and thorax are delicately punctate; a grooved line extends forward from the front ocellus; supraorbital foveæ are indicated by scars above the eyes; the last joint of the antennæ is slightly arcuate and pointed at apex within; pronotum with a median groove or notch; mesonotum with a median longitudinal line on the anterior half and an abbreviated line on each side of it anteriorly; the mesopleural furrow, the furrows of the metathoracic enclosure and its middle furrow are crenate. Wings hyaline, the stigma and veins brown. Abdomen elongate, subcylindrical, about twice the length of the thorax, polished, but the second and third dorsal segments under a strong lens, show fine, close, delicate transverse aciculations.

Type.—Cat. No. 5742, U. S. Nat. Museum. From Wrangell (H. F. Wickham). Two specimens.

Family **PEMPHREDONIDÆ**.Genus **Passalæcus** Shuckard.**PASSALÆCUS CUSPIDATUS** Smith.

Passalæcus cuspidatus SMITH, Cat. Hym. Brit. Mus., iv, p. 427, ♀, 1856.
—CRESSON, Syn. Hym. North Am., p. 283, 1883.—CRESSON, Syn. Hym. North Am., p. 283, 1887.—FOX, Trans. Am. Ent. Soc., xix, p. 321, 1892.—DALLA TORRE, Cat. Hym., viii, p. 368, 1897.—ASHMEAD, Can. Ent., xxxi, p. 223, 1899.

Type in British Museum. From Wrangell (H. F. Wickham). The species is also found in British Columbia (Hudson Bay Territory) and in Colorado.

Genus **Mimesa** Shuckard.**MIMESA PROPINQUA** Kincaid.

Mimesa propinqua KINCAID, Proc. Wash. Acad. Sci., ii, p. 508, ♂, 1900.

Type.—Cat. No. 5314, U. S. Nat. Museum. From Fox Point, July 28.

Proc. Wash. Acad. Sci., May, 1902.

Superfamily III. **VESPOIDEA** Ashmead.Family **POMPILIDÆ**.Subfamily *POMPILINÆ*.Genus **Arachnophila** Ashmead.¹**ARACHNOPHILA SEPTENTRIONALIS** Kincaid.

Arachnospila (err. imp.) *septentrionalis* KINCAID, Proc. Wash. Acad. Sci., II, p. 509, 1900.

Type.—Cat. No. 5313, U. S. Nat. Museum. From Kukak Bay.

Family **VESPIDÆ**.Subfamily *VESPINÆ*.Genus **Vespa** Linné.**VESPA MARGINATA** Kirby.

Vespa marginata KIRBY, Faun. Bor.-Amer., IV, p. 265, 1837.—KINCAID, Proc. Wash. Acad. Sci., II, p. 510, 1900.

Vespa arenaria SAUSSURE (*nec* Fabricius), Stettin. ent. Zeitg., XVIII, p. 116, ♀, 1857.—CRESSON, Syn. Hym. North Am., p. 290, 1887.—DALLA TORRE, Cat. Hym., IX, p. 137 (partim), 1894.

From Kukak Bay, July 3.

VESPA BOREALIS Kirby.

Vespa borealis KIRBY, Faun. Bor.-Amer., IV, p. 264, 1837.—SAUSSURE, Etud. fam. Vesp., II, p. 140, 1853.—CRESSON, Syn. Hym. North Am., p. 290, 1887.—KINCAID, Proc. Wash. Acad. Sci., II, p. 510, 1900.

From Sitka, June 15; Virgin Bay.

Family **EUMENIDÆ**.Genus **Odynerus** Latreille.**ODYNERUS ALBOPHALERATUS** Saussure.

Odynerus (*Ancystrocerus*) *albophaleratus* SAUSSURE, Étud. fam. Vesp., III, p. 217, ♂, 1856.—SAUSSURE, Smithsonian Miscell. Collect., XIV, p. 167, 1875.—PROVANCHER, Natur. Can., XIII, p. 140, 1882.—PROVANCHER, Fn. ent. du Can. Hym., p. 675, 1883.—CRESSON, Syn. Hym. North Am., p. 287, 1887.—KINCAID, Proc. Wash. Acad. Sci., II, p. 510, 1900.

From Kukak Bay, July 3; Seldovia, July 21; Fox Point, July 28.

¹ The type of this genus is *Pompilus divisus* Cresson.

Family **CHRYSIDIDÆ**.Genus **Omalus** Panzer.**OMALUS SINUOSUS** (Say).*Hedychrum sinuosum* SAY, Contrib. MacLure Lyc. Phila., p. 82, 1828.—LECONTE, Ed. Say's Works, I, p. 384, 1859.*Hedychrum janus* HALDEMAN, Proc. Acad. Nat. Sci. Phila., p. 53, 1844.*Elampus sinuosum* NORTON, Trans. Am. Ent. Soc., VII, p. 234, 1879.*Elampus purpurascens* PROVANCHER, Nat. Can., XII, p. 303, 1881.—PROVANCHER, Fn. ent. du Can. Hym., p. 582, 1883.*Omalus sinuosus* AARON, Trans. Am. Ent. Soc., XII, p. 214, 1885.—CRESSON, Syn. Hym. North Am., p. 252, 1887.—PROVANCHER, Add. Fn. du Can. Hym., p. 219, 1887.*Elampus sinuosus* MOCSARY, Monogr. Chrysid., p. 103, 1889.—DALLA TORRE, Cat. Hym., VI, p. 17, 1892.

From Fort Yukon (L. M. Turner).

Superfamily IV. **FORMICOIDEA** Ashmead.Family **MYRMICIDÆ**.Genus **Myrmica** Latreille.**MYRMICA LÆVINODIS** Nylander.*Myrmica lævinodis* NYLANDER, Acta Soc. Sc. Fennic; III, p. 927, ♀ ♂, 1846, Tab. 18, f. 5, 31.—DALLA TORRE, Cat. Hym., VII, p. 110 (Full bibliography), 1893.

From Nushagak River (Chas. W. McKay). Occurs also in Siberia and various parts of the United States.

MYRMICA SABULETI LOBIFRONS Pergande.*Myrmica sabuleti* var. *lobifrons* PERGANDE, Proc. Wash. Acad. Sci., II, p. 321, ♀, 1900.*Type*.—Cat. No. 5279, U. S. Nat. Museum. From Alaska.**MYRMICA SULCINOIDES** Emery.*Myrmica sulcinoides* EMERY, Zool. Jahrb., XI, p. 313, ♀, 1898.—PERGANDE, Proc. Wash. Acad. Sci., II, p. 52, 1900.

From Sitka.

Genus **Leptothorax** Mayr.**LEPTOTHORAX YANKEE** Emery, var. **KINCAIDI** Pergande.*Leptothorax yankee* var. *kincaidi* PERGANDE, Proc. Wash. Acad. Sci., II, p. 520, ♀ ♂, 1900.*Type*.—Cat. No. 5278, U. S. Nat. Museum. From Metlakatla.

Family FORMICIDÆ.

Genus *Formica* Linné.

FORMICA NEORUFIBARBIS Emery.

Formica neorufibarbis EMERY, Zool. Jahrb., XII, p. 660, 1899.—PERGANDE, Proc. Wash. Acad. Sci., II, p. 519, ♀, 1900.

From Kodiak, Metlakatla and Sitka.

Genus *Lasius* Fabricius.

LASIUS NIGER SITKENSIS Pergande.

Lasius niger var. *sitkensis* PERGANDE, Proc. Wash. Acad. Sci., II, p. 519, ♀, 1900.

Type.—Cat. No. 5277, U. S. Nat. Museum. From Sitka.

Superfamily V. PROCTOTRYPOIDEA Ashmead.

Family PROCTOTRYPIDÆ.

Genus *Proctotypes* Latreille.

PROCTOTRYPES NIGRIPES sp. nov.

Male.—Length 4 mm. Polished black; legs brown-black, with the tarsi and articulations rufo-piceous; tegulæ pale honey-yellow. Wings hyaline, without any internal veins, the costal veins and the stigma brown. Mandibles rufous. Palpi dark brown. Antennæ entirely black, a little longer than the head and thorax united and clothed with a short, moderately dense whitish pubescence, the joints of the flagellum elongate, the first and last joints about equal and longer than the intermediate joints, the first joint being a little longer and thicker than the second, about five times as long as thick, the second and following joints gradually shortening to the penultimate.

The head is transverse about as wide as the thorax between the tegulæ, the ocelli pale. The thorax is smooth, impunctate, except the metathorax which is rugulose, with an abbreviated median carina and nearly twice as long as high. The petiole of the abdomen is a little longer than wide and striate, the rest of the abdomen, except at the extreme base where it joins the petiole, is smooth, shining and impunctate, the extreme base with several striæ.

Type.—Cat. No. 5517, U. S. Nat. Museum. From St. Paul Island (Fur Seal Commission), one male.

On account of its metathoracic and wing characteristics this new species will fall in a table of the North American species next to *P. texanus* Ashmead, from which it is readily separated by its larger size, structure of antennæ and color of the legs.

Family BELYTIDÆ.

Genus *Zelotypa* Förster.

Five species have already been characterized in this genus in our fauna, one from Texas, one from Florida, two from Virginia and one from Canada, known only in the male sex. It is somewhat surprising, therefore, to find no less than three additional species in the Alaskan material, two being represented in the female sex.

These new species may be tabulated as follows :

Males 3.

Females.

Apterous forms..... 2.

Winged forms.

Marginal cell fully (or a little more than) twice as long as the marginal vein.

Black, with scutellum, middle mesothoracic lobe and legs honey- or brownish-yellow *Z. scutellata*.

Body wholly black, the legs honey-yellow, but with the hind coxæ basally and the clavate part of the hind femora obfuscated or fuscous.

Z. borealis.

2. Black, the scutellum, the middle thoracic lobe, first two joints of antennæ and the legs honey- or brownish-yellow..... *Z. scutellata*.

3. Marginal cell and the marginal vein not short, about equal in length.

Black, scape and pedicel brownish-yellow; first joint of the flagellum excised beneath for more than half its length; legs honey-yellow; hind coxæ basally, clavate part of hind femora and their tibiæ apically obfuscated.... *Z. alaskensis*.

ZELOTYPA SCUTELLATA sp. nov.

Female.—Winged form. Length 2 to 2.2 mm. Head, thorax, except the middle mesothoracic lobe, and the abdomen black, smooth and shining; the scutellum, the middle mesothoracic lobe, the first two joints of antennæ (sometimes the first five or six), and the legs, brownish-yellow or honey-yellow. Wings hyaline, the veins brown, the tegulæ pale yellowish. The antennæ are not quite the length of the body, 15-jointed; the scape is as long as the pedicel and first two joints of flagellum united and slightly curved but not especially thick;

the first joint of the flagellum is the longest, about one-half longer than the second, the following to the fifth shortening, the fifth oblong, joints 6 to 12 submoniliform, very slightly longer than thick, the last joint fusiform, as long as the fourth. The metathorax is bounded by an elevated carina posteriorly and traversed by five longitudinal carinae (a median and two on each side of it). The wing venation is normal, the marginal cell being fully twice as long as the marginal vein, the stigmal vein, or first branch of the radius, being straight, perpendicular and about two-thirds the length of the marginal vein. The abdomen, with its petiole, is very little longer than the head and thorax united, the petiole being rather thick, longitudinally furrowed and not quite $2\frac{1}{2}$ times as long as thick; the body of the abdomen is ovate, pointed at apex, highly polished and impunctate, except some striae at its base where it joins the petiole, the first segment occupying most of its entire surface.

Female.—Wingless form. Length 2.5 mm. Agrees well in structure and color with the winged form, except the antennae are a little longer and the legs are more decidedly yellow.

Type.—Cat. No. 5518, U. S. Nat. Museum. From St. Paul Island and Unalaska. Nine specimens.

ZELOTYPA BOREALIS sp. nov.

Female.—Length 3 mm. Polished black; first five or six joints of the antennae brownish-yellow; legs honey-yellow, the hind coxae basally and the clavate part of the hind femora blackish or obfuscated. Wings hyaline, the venation light brown, the tegulae yellowish.

The antennae are rather stout, shorter than the body, 15-jointed; the scape is stout, a little thicker at the middle than at the ends and as long as the first three joints of the flagellum (excluding the pedicel) united; the first joint of the flagellum is the longest, very nearly as long as the second and third united, the third joint is only two-thirds the length of the second, the fourth joint is oblong, the following to last being moniliform, briefly pedicellate, 6 to 12 a little wider than long, the last ovate, not longer than the fourth. Metathorax as in *Z. scutellata*. Abdomen pointed ovate, the petiole stout, only twice as long as wide, longitudinally furrowed, the interstices between the furrows above, wrinkled; body of abdomen much as in previous species except that there is a median grooved line above that extends to nearly the middle of the first segment. Wing venation as in previous species except that the marginal cell is slightly more than twice as long as the marginal vein.

Type.—Cat. No. 5519, U. S. Nat. Museum. From Muir Inlet, June 12 (Fur Seal Commission). Two female specimens.

ZELOTYPALASKENSIS sp. nov.

Male.—Length 2.5 mm. Polished black; first two joints of antennæ, tegulæ and the legs brownish-yellow or honey-yellow, the hind coxæ basally, the clavate part of their femora, and their tibiæ apically, obfuscated; wings hyaline, the veins brown.

The antennæ are fully as long as the body, 14-jointed, the joints elongate, cylindrical; the scape is slender and about as long as the pedicel and the first joint of the flagellum united, or very slightly longer; the pedicel is scarcely longer than thick; the first joint of the flagellum is the longest joint, a little longer than the second and excised beneath for more than half its length and appearing as if angulated when viewed from the side; the following joints are subequal, imperceptibly shortening to the last, the penultimate being hardly four times as long as thick, the last being one-third longer than the penultimate. The front wings differ from the two previous species in having the marginal vein and the submarginal cell of approximately equal length, the marginal vein being a little more than thrice as long as the stigmal or first branch of the radius. The petiole of the abdomen is a little more than four times as long as thick, smooth or nearly so, but with a few longitudinal carinæ; body of abdomen oblong-oval, smooth and highly polished, the medial grooved line above extending only to the basal third of first segment.

Type.—Cat. No. 5520, U. S. Nat. Museum. From Virgin Bay, June 26. One specimen.

Genus **Aclista** Förster.

ACLISTA CALIFORNICA Ashmead.

Aclista californica ASHMEAD, Monogr. N. A. Proctotryp., p. 378, 1893.—DALLA TORRE, Cat. Hym., v, p. 452, 1898.

Type.—Cat. No. 5755, U. S. Nat. Museum (Ashmead Collection). From Belkofski, July 22. One specimen not distinguishable from the type taken in California.

Genus **Zygota** Förster.

ZYGOTA AMERICANA Ashmead.

Zygota americana ASHMEAD, Monogr. N. A. Proctotryp., p. 373, 1893.—DALLA TORRE, Cat. Hym., v, p. 453, 1898.—ASHMEAD, Fur Seals and Fur Seal Islands, iv, p. 336, 1899.

Type.—Cat. No. 5756, U. S. Nat. Museum (Ashmead Collection). From Bering Island (Barrett-Hamilton); Sitka.

Family DIAPRIIDÆ.

Genus **Spilomicrus** Westwood.

SPILOMICRUS ALASKENSIS sp. nov.

Female.—Length 1.8 mm. Polished black; legs black, with the sutures between the coxæ and the trochanters, the knees, apices of tibiæ and all tarsi, except last joint, honey-yellow, the tibiæ, except as noted, fuscous. Wings hyaline, the veins brown-black, the marginal vein being fully four times as long as thick, the stigmal vein very short, wider than long, with a delicate fuscous ray from its tip, one part extending backwards as in a Belytid, the other extending forward and forming a very narrow indistinct, but open marginal cell.

The thorax has the parapsidal furrows complete, each parapside with a large, deep, longitudinal fovea on its disk, the scutellum with a large fovea at its base, not divided by a median carina, while the meta-thorax has a distinct median carina.

The abdomen is conic-ovate, pointed at apex and highly polished, with the petiole opaque and only a little longer than thick.

Type.—Cat. No. 5521, U. S. Nat. Museum. From Muir Inlet, June 12 (Fur Seal Commision). One specimen.

This species differs from all others in our fauna by the simple basal scutellar fovea, by the deeply foveate parapsides, by venation and by the color of the legs.

Family CERAPHRONIDÆ.

Subfamily **MEGASPILINÆ.**

Genus **Lygocerus** Förster.

LYGOCERUS ALASKENSIS sp. nov.

Female.—Length 2 mm. Black and shining, not sculptured; palpi brownish; mandibles dark rufo-piceous; antennæ entirely black, except a faint yellowish tinge at the extreme apex of the pedicel, legs black, with the knees, tibiæ, except medially, and the tarsi except the last joint, dark honey-yellow, the tibiæ medially more or less fuscous, the claws black; tegulæ piceous. Wings hyaline, the large stigma, the costa and the stigmal vein being reddish-brown.

The head is polished, impunctate, seen from in front wider than long and with some short, sparse hairs anteriorly below the insertion of the antennæ. Eyes oblong-oval, faintly hairy. Antennæ 11-jointed, black, and reaching to the middle of the abdomen; the scape is as long as the pedicel and the first two joints of the flagellum united; the first and last joints of the flagellum are equal in length and a little longer than the intermediate joints which are subequal and scarcely more than twice as long as thick, the first and the last joints being a little more than thrice as long as thick; the pedicel is not quite two-thirds the length of the first joint of the flagellum.

The thorax is smooth and shining, the mesonotum having three distinct furrows, the pronotum being very short while the metathorax is abruptly shortened and faintly alutaceous.

The abdomen is ovate, polished black, subdepressed, wider than thick dorso-ventrally, a little longer than the head and thorax united, the ovipositor subexserted, the petiole extremely short, transverse and striate; body of abdomen has an elevated rim at extreme base where it unites with the petiole.

Type.—Cat. No. 5522, U. S. Nat. Museum. From St. Paul Island, August 10 (Fur Seal Commission). One specimen.

This species is allied to *L. stigmatus* Say but it is slightly larger and easily separated by the relative lengths of the flagellar joints of antennæ and by the difference in the pedicel.

Superfamily VI. CYNIPOIDEA Ashmead.

Family FIGITIDÆ.

Subfamily EUCÆLINÆ.

Genus *Tetrarhapta* Förster.

TETRARHAPTA ALASKENSIS sp. nov.

(Pl. IX, fig. 2.)

Female.—Length 1.4 mm. Polished black; the mandibles, knees, base and tips of tibiæ and all tarsi, testaceous or reddish; wings hyaline, largely pubescent, the apex of the anterior wings subemarginate, the veins brown-black, the marginal cell open all along the outer margin.

The 13-jointed antennæ terminate in a large 4-jointed club, the joints being fluted, the first being a little shorter than the second, the second and third subequal, the last large, ovate, one-half longer than

the third; the joints of the funicle are slender, subcylindrical, the first being fully twice as long as the second, the following very imperceptibly shortening to the club; the scape is obconical, about one-third longer than the pedicel. The scutellum, along the sides, is delicately, longitudinally aciculate, the cup being very narrow, ellipsoidal; the metathorax is smooth and shining, or at the most, faintly alutaceous and bicarinate.

Male.—Length 1.5 mm. Agrees well with the female except that the antennæ are longer, 15-jointed, with the first joint of the flagellum long and stout, slightly curved, and about as long as the second and third joints united, the following joints being nearly equal, about thrice as long as thick and all strongly fluted.

Type.—Cat. No. 5523, U. S. Nat. Museum. From St. Paul Island, August 15 (Fur Seal Commission). Described from one male and three female specimens.

Genus *Eucæla* Westwood.

EUCÆLA ALASKENSIS sp. nov.

Female.—Length 2 mm. Polished black; the mandibles, the antennæ, except the scape and pedicel, and the legs, except more or less of the middle and hind coxæ, rufo-testaceous, the femora somewhat obfuscated toward base; wings hyaline, pubescent, the veins reddish-brown, the marginal cell completely closed, tegulæ piceous black.

The first two joints of the flagellum are cylindrical, subequal, a little more than twice longer than thick, the following joints gradually thickening toward apex, elliptic-oval, delicately fluted, and subequal in length, except the last, which is considerably longer than the penultimate. The scutellum at the sides is opaque, finely rugulose, the cup oval, with its disk slightly depressed, a fovea posteriorly and a row of minute punctures along its margins. The metathorax above and posteriorly is finely rugulose, faintly pubescent and bicarinate, its pleura being smooth and polished. Abdomen normal, a little longer than the head and thorax united and with a narrow pubescent girdle at base.

Type.—Cat. No. 5524, U. S. Nat. Museum. From Seldovia, July 2. One female specimen.

Subfamily *ALLOTRIINÆ*.

Genus *Alloxysta* Förster.

ALLOXYSTA ALASKENSIS sp. nov.

Male.—Length 1 to 1.1 mm. Polished black; the face below the antennæ, cheeks, mandibles, palpi, antennæ and legs, pale yellow, the

femora and tibiæ, except their apices, obfuscated or light brownish; wings hyaline, the veins brownish-yellow.

The antennæ are long, filiform, longer than the body, 14-jointed; the flagellar joints 1 to 3 are the longest joints, the first straight, cylindrical, more than twice as long as thick, the second and third somewhat thickened and both curved, thrice as long as thick, the following joints slender, hardly more than twice as long as thick and clothed with a short, fine pubescence. Thorax as in *Allotria*. Wings nearly twice the length of the body, the marginal cell being open all along the front margin, the second abscissa of the radius being curved and nearly twice the length of the first.

Female.—Length 1.5 mm. Agrees well with the male except that the head is castaneous, the yellow of the face beginning a little above the insertion of the antennæ, the first five joints of the antennæ and the legs being yellow, the rest of the antennæ being brown-black.

The antennæ are as long as the body, 14-jointed, slightly thickened toward apex, the joints of the flagellum elongate, the second and third joints of same being longer than the first, the second being longer than the third, and the longest joint of all, the following joints to the last being nearly equal in length, the last being longer than the penultimate.

Type.—Cat. No. 5525, U. S. Nat. Museum. From Muir Inlet, June 12; St. Paul Island, August 6 (Fur Seal Commission). Three male and two female specimens.

Superfamily VII. CHALCIDOIDEA.

Family TORYMIDÆ.

Genus *Torymus* Dalman.

TORYMUS CECIDOMYLÆ (Walker).

Callimome cecidomyiæ WALKER, Ann. & Mag. Nat. Hist., XIV, p. 15, ♀, 1844.—CRESSON, Syn. Hym. North Am., p. 237, 1887.—DALLA TORRE, Cat. Hym., v, p. 302, 1898.

Type in British Museum. From Kodiak, July 20; Popof Island, July; Virgin Bay, June 24. Four specimens.

Originally described from Hudson Bay Territory. It is a parasite on *Cecidomyia communis* Barnston MS. The four specimens taken are without much doubt referable to this species. They exhibit considerable variation in color of the antennal scape and of the legs. The scape is most frequently metallic, though sometimes wholly yellow beneath, or with only a yellow spot at extreme base, the legs varying in the amount of green on the femora and of brown on the tibiæ.

Family MISCOGASTERIDÆ.

Subfamily TRIDYMINÆ.

Genus *Terobia* Förster.

TEROBIA VULGARIS sp. nov.

(Pl. IX, fig. 3.)

Female.—Length 1.8 to 2 mm. Most variable in color, metallic bluish-green, æneous or bronzed green, with bluish, purplish and brassy reflections, the parapsides, mesopleura and metathorax, most frequently bluish or blue-black, faintly tinged with metallic green, the head, prothorax and at least the middle mesothoracic lobe metallic green or brassy; abdomen most frequently æneous black, sometimes with a decided brassy tinge; scape, pedicel and legs, except sutures of trochanters, tips of femora, the tibiæ and the tarsi except as hereafter noted, æneous black or metallic; the sutures of trochanters, tips of femora, the tibiæ, except apices of the middle and hind tibiæ, and the tarsi, except last joint, honey-yellow or brownish-yellow; tips of middle and hind tibiæ and the last joint of the tarsi dark brown or fuscous; the middle tibiæ sometimes before the middle are more or less obfuscated; the flagellum black or brown-black, sparsely pubescent; tegulæ testaceous or yellowish; wings hyaline, the venation brown; the stigmal vein with its club is rather long, but a little shorter than the marginal, the club being large and with a small uncus obliquely directed towards the margin of the wing, and if continued would form a triangular marginal cell; the postmarginal vein is very long, nearly twice as long as the marginal.

The head is transverse, a little more than thrice as wide as thick antero-posteriorly, much wider than the prothorax and possibly a little wider than the mesothorax from tegula to tegula; viewed from in front it is a little wider than long, obtusely triangular; posteriorly it is smooth, on the vertex and anteriorly it is feebly alutaceously sculptured; ocelli small, arranged in an obtuse triangle; eyes oblong-oval; the malar space distinct, at least one-third the length of the eye; clypeus small, obtrapezoidal, indistinctly separated, and indistinctly bidentate anteriorly or with a slight median incision; mandibles (?) 4-dentate.

The antennæ are 13-jointed, with 2 minute ring-joints inserted near the middle of the face above a line drawn from the base of the eyes; the scape is about as long as the first three funicle joints united; pedicel obconical, scarcely longer than thick at apex; the flagellum is subclavate, thrice as long as the scape, with the joints all delicately fluted, the funicle being 6-jointed, the joints oblong, about one and a half

times as long as thick, subequal in length, the first slightly the smallest joint; the club fusiform, stouter than the funicle and 3-jointed, the first and second joints subquadrate, the third obtusely conical.

The thorax, except the metanotum, is almost smooth, or at most with a faint or microscopic reticulate sculpture, the disk of the mesopleura being smooth and highly polished, the parapsidal furrows distinct and complete, the mesothoracic lobes subconvex; the scutellum is divided by a transverse grooved line near its apex; the metathorax is shagreened, without a distinct median carina but with the lateral carinæ more or less indicated; while the spiracles are small and round.

The abdomen is briefly petiolate, shorter than the thorax and highly polished, impunctate, except the petiole which is shagreened; the body of the abdomen seen from above is obovate, seen from the side it is more conical, the venter being subcompressed; the first (body) segment is the longest, fully as long as segments 2 and 3 united, the following segments very gradually shortening.

Male.—Length 1.6 to 1.8 mm. Agrees well with the female, except it is usually more bluish, its antennal and abdominal characters are different and the tibiæ are fuscous or brown with both ends yellow (more rarely wholly yellow with the apical half of the femora yellow). The antennæ are slightly longer, the flagellum being filiform, not subclavate, and clothed with sparse but more erect hairs than in the female, the scape being clavate, thickened towards apex beneath, the funicle joints being fully twice, or more than twice, as long as thick, the first joint being much longer, from $3\frac{1}{2}$ to 4 times as long as thick, rarely only thrice as long as thick. Abdomen oblong-oval.

Type.—Cat. No. 5526, U. S. Nat. Museum. From St. Paul Island (Fur Seal Commission). Many specimens.

Family PTEROMALIDÆ.

Subfamily PTEROMALINÆ.

Genus *Eutelus* Walker.

EUTELUS CONFUSUS sp. nov.

Female.—Length 1.5 mm. Head and thorax bluish, finely and closely punctate, the pleura and metathorax with a metallic greenish tinge; antennæ dark brown, inserted far anteriorly, near the anterior margin of the head; legs yellowish with the coxæ metallic green, the anterior and middle femora, except tips, brown, the hind femora black or æneous black. Wings hyaline, the tegulæ and veins pale yellowish.

Abdomen conic-ovate, æneous black, depressed above, carinate or boat-shaped beneath, and a little longer than the head and thorax united. The flagellum is subclavate, less than twice as long as the scape, the funicle joints not longer than wide, with at least the fifth and sixth joints wider than long.

Male.—Length 1.2 mm. Metallic blue green, with the scape of the antennæ and the pedicel, except a spot above at base, and the legs, except the coxæ, yellowish-white, the funicle light brownish, the joints gradually increasing in size, in outline all obtrapezoidal, while the club is fusiform and black.

Type.—Cat. No. 5527, U. S. Nat. Museum. From St. Paul Island (Fur Seal Commission).

Family EULOPHIDÆ.

Subfamily TETRASTICHINÆ.

Genus *Tetrastichus* Haliday.

TETRASTICHUS ANTHRACINUS sp. nov.

Female.—Length 1.6 mm. Coal black, impunctate; mandibles, all tarsi except the last joint, a spot on the middle and hind knees, apices of the front femora, and their tibiæ, except apically, honey-yellow; antennæ dark brown, pubescent. Wings hyaline, the tegulæ black, the veins dark brown. Abdomen long-ovate, longer than the head and thorax united, carinate beneath.

Type.—Cat. No. 5528, U. S. Nat. Museum. From Seldovia, July 7. One specimen.

TETRASTICHUS ALASKENSIS sp. nov.

Male.—Length 1.2 mm. Black, the abdomen æneous black; mandibles, trochanters, apices of all femora, the front tibiæ, an annulus at base of middle and hind tibiæ, and all tarsi, except the last joint, brownish-yellow; antennæ black pubescent. Wings hyaline, the tegulæ yellow, the veins light brown, the base of the stigmal vein being pallid or whitish. Abdomen pointed ovate, not longer than the head and thorax united, above flat, beneath convex.

Type.—Cat. No. 5529, U. S. Nat. Museum. From Popof Island, July 19. One specimen.

Subfamily *ELACHISTINÆ*.Genus *Elachistus* Spinola.*ELACHISTUS GLACIALIS* sp. nov.

Female.—Length 2 mm. Polished black, impunctate, clothed with a sparse, whitish pubescence; mandibles dark rufous; legs except coxæ and more or less of the femora, brownish-yellow, the coxæ black, the front and middle femora toward the base fuscous, the hind femora, except at apex, dark-brown; scape and pedicel of antennæ black, the flagellum brown-black, the funicle 4-jointed, the first joint the longest, about twice as long as thick, the following joints shortening, the fourth being only about as long as thick, the club cone-shaped; wings ample, hyaline, with the veins brown, the marginal vein long, twice the length of the stigmal or as long as the subcostal vein, the postmarginal a little shorter than the marginal; abdomen broadly ovate, depressed, and scarcely as long as the thorax, the ovipositor subexserted.

Male.—Length 1.8 mm. Agrees well with the female, except in the following differences: The legs, except the coxæ, knees and tarsi, are brown-black or fuscous, the coxæ being black, the knees and tarsi yellowish; the flagellum is compressed, the joints of the funicle briefly pedicellate, appearing subquadrate, as seen from the side, the first joint being oblong, while the abdomen is oblong-oval.

Type.—Cat. No. 5530, U. S. Nat. Museum. From Muir Inlet, June 12 (Fur Seal Commission), one female; Yakutat, June 21, one male.

Subfamily *EULOPHINÆ*.Genus *Eulophus* Geoffroy.*EULOPHUS KUKAKENSIS* sp. nov.

Male.—Length 1.5 mm. Æneous black, shagreened, the pronotum above, the scutellum, the mesopleura posteriorly and the metapleura with a decided greenish metallic tinge; flagellum brown-black, with 3 very long branches, each branch ciliate with long hairs, subequal in length, the first branch, however, a little the longest and as long as the flagellum; coxæ metallic, the trochanters, apices of the front and middle femora and tibiæ, except the hind tibiæ, and tarsi, honey-yellow, rest of the femora black, the hind tibiæ fuscous; wings hyaline, the veins light brownish; abdomen oblong, æneous black, except a yellow spot or band near its base, visible both from beneath and above.

Type.—Cat. No. 5531, U. S. Nat. Museum. From Kukak Bay, July 4, one male specimen.

Superfamily VIII. **ICHNEUMONOIDEA** Ashmead.

Family **ICHNEUMONIDÆ**.

Tribe *JOPPINI*.

Genus **Automalus** Wesmael.

AUTOMALUS NIGROPILOSUS sp. nov.

(Pl. IX, fig. 4.)

Male.—Length 19 mm. Head, except face below insertion of antennæ, antennæ, except a spot on scape beneath, thorax, abdomen, coxæ and first joint of all trochanters, black; face below antennæ and spot on scape beneath, yellow; legs, except coxæ and first joint of trochanters, flavo-ferruginous. Wings hyaline, or at least only faintly tinged, the stigma and veins brown, the disco-cubital vein broken by a slight stump of a vein a little beyond its middle, the second recurrent nervure broken by a slight stump of a vein near its middle.

The head and thorax are shining but sparsely punctate and sparsely clothed with a black pubescence, the metathorax being rugulose, obliquely truncate behind, without a distinct areola, but with long lateral areas and distinct pleural carinæ. The abdomen is elongate, nearly twice as long as the head and thorax united, opaque, the petiole at apex and the second segment rather coarsely rugulosely punctate, the following segments more finely and evenly sculptured, the gastro-cæli large, oblique, the space between being nearly as wide as their length.

Type.—Cat. No. 5532, U. S. Nat. Museum (Fur Seal Commission). From Juneau, July 25; Popof Island, July 13. Three specimens.

Tribe *ICHNEUMONINI*.

Genus **Stenichneumon** Thomson.

STENICHNEUMON UNALASKÆ sp. nov.

Male.—Length 16 mm. Black; face below the insertion of the antennæ, including the clypeus, the two apical joints of palpi, scape beneath, tegulæ, an abbreviated line on the upper posterior margin of the pronotum, apices of the front and middle femora, all tibiæ, except

the hind tibiæ at apex, all tarsi, except the last three joints of hind tarsi, and abdominal segments 2, 3 and 4, except a lateral streak on the second basally, a band at base of second and third, yellow. There is also a narrow transverse yellow line at the apex of the fifth abdominal segment. Wings subhyaline, the stigma and veins, except the subcostal vein at its apical two thirds, brown. The head and thorax are distinctly, rather closely punctate, the clypeus very sparsely punctate, the mesopleura beyond the discal impression and a spot near the upper angles of the metapleura alone smooth and impunctate. The metathorax is rugulose, the areola being large, quadrate, the lateral basal and median areas being confluent. The hind coxæ are strongly punctate, the front and middle coxæ less strongly punctate. Wings with the venation normal, the submedian cell longer than the median, the disco-cubital nervure not broken by a distinct stump of a vein, the areolet pentagonal, but with the sides strongly convergent above, the transverse cubiti almost meeting. The abdomen is about twice as long as the head and thorax united, the petiole rugulose at apical third, segments 2 to 4 rugulosely punctate, the fourth less distinctly at apex, the following segments nearly smooth, at most alutaceously sculptured and finely, sparsely punctate; gastrocœli broad and deep with striæ at bottom.

Type.—Cat. No. 5533, U. S. Nat. Museum. From Unalaska, July 17. One specimen.

Genus *Ichneumon* Linné.

TABLE OF SPECIES.

- Body *mostly black*, or head and thorax black..... 2.
 Body *mostly rufous*, or ferruginous, or thorax never entirely black. 10.
 2. Abdomen *not entirely black*..... 4.
 Abdomen *entirely black*.
 Face below antennæ ivory white 3.
 Face entirely black.
 Legs, except hind tarsi, red.....*I. imitator*.
 3. Scutellum and postscutellum yellow; scape beneath yellowish or whitish; legs red; coxæ and trochanters, except more or less of the first joint of front and middle pairs, black; anterior tibiæ and tarsi paler, yellowish or brownish-yellow; tips of hind tibiæ and more or less of their tarsi, fuscous.....*I. sitkensis*.
 Scutellum with yellow spot at apex; postscutellum and scape beneath black; legs red, but with the coxæ, except a white spot on front pair beneath, trochanters, front femora beneath, middle

- femora more or less basally and hind femora black; anterior tibiae and tarsi yellowish; apex of hind tibiae and their tarsi fuscous. *I. kincaidi*.
4. Abdomen *not nearly black*, with one or more segments red or yellow 5.
 Abdomen *almost wholly black*, with only extreme apex of the petiole and extreme apices of second and third segments narrowly testaceous.
 Face below antennæ, scape beneath, palpi, an abbreviated line in front of tegulæ and one below, and the anterior tarsi, ivory or yellowish-white; scutellum and postscutellum yellow; legs red, with all coxæ, first joint of trochanters, hind femora within tips of their tibiae and their tarsi, black..... *I. simulator*.
5. Abdomen with second and third segments, and sometimes the fourth or others, more or less red or yellow but stained or marked with black..... 6.
 Abdomen with second and third segments entirely red 8.
6. Second and third segments more or less yellow 9.
 Second and third segments more or less red.
 Scutellum yellow..... 7.
 Scutellum black.
 Face entirely black; legs black, with the apices of the front and middle femora and all tibiae and tarsi, except sometimes the hind tibiae at apex reddish-yellow. Male..... *I. cervulus*.
7. Face below antennæ and scape beneath, yellow.
 Legs black with anterior femora, except beneath toward base, apices of middle femora, spot at base of hind femora within, all tibiae, except apical third of hind tibiae and tarsi, except apices of joints 1 to 4, and fifth joint of hind tarsi entirely, reddish-yellow. Male. *I. kodiakensis*.
8. Face below antennæ, except an orbital line and scape beneath, black; scutellum and legs, except coxæ and trochanters, red. Male. *I. popofensis*.
 Face below antennæ and scape beneath, yellow; scutellum red or with a red spot; the legs red, with the coxæ, trochanters, apices of hind femora, and their tibiae, black. Male..... *I. glacialis*.
9. Face, scape beneath tegulæ, an abbreviated line in front and below it, the legs (except a spot beneath and behind the front and middle femora, a small spot on middle coxæ, hind coxæ, first joint of their trochanters, their femora and apex of their tibiae), the scutellum and broad bands on second and third abdominal segments, yellow; sometimes the collar and fourth abdominal segment are maculate with yellow. Male..... *I. wilsoni*.
10. Males..... 11.
 Females.
 Ferruginous; sutures of thorax, prosternum, mesosternum broadly

along anterior margin, metathorax anteriorly and beneath, including metasternum and lower half of metapleura, and a band at base of second, third and fourth abdominal segments, black...*I. brevipennis*.

11. Face below antennæ and scape beneath yellow.

Thorax mostly black, the mesonotum and the scutellum rufous; legs, except the hind tarsi and the front coxæ and tarsi, ferruginous, the hind tarsi fuscous, the front coxæ and tarsi pale yellowish or yellowish-white.....*I. brevipennis*.

ICHNEUMON IMITATOR sp. nov.

Male.—Length 10.5 to 11 mm. Black and shining but punctate; mandibles rufo-piceous; palpi fuscous; tegulæ and the epitegulæ testaceous; legs, except the claws, pulvilli and hind tarsi, which are black or fuscous, red. Wings subfuliginous, the stigma except medially, and the veins brown-black, the stigma medially being testaceous. The antennæ are 37-jointed and extend to beyond the middle of the abdomen, tapering off to a point at apex, the joints after the eighth being more or less nodose beneath. The pubescence on the face, mandibles, and sides of the thorax is whitish, that on the vertex of the head, the mesonotum, and the scutellum being more or less fuscous, although there are some whitish hairs intermixed with it. The metathoracic areola is large, quadrate, a little longer than wide, the basal lateral and the median lateral areas being confluent. The wing venation is normal, the submedian cell a little longer than the median, the discocubital nervure broken by a stump of a vein very near its middle, the areolet irregularly pentagonal, the transverse cubiti converging above, the upper face formed by them, or the part represented by the second abscissa of the radius, being much the shortest face of the five; the second recurrent nervure joins the areolet much beyond its middle, while the transverse median nervure in the hind wings is nearly straight, but broken by the subdiscoidal nervure below the middle or at about its basal third. The abdomen is elongate, nearly twice as long as the head and thorax united, black except the venter, which is more or less dark rufous, the ventral segments 2 to 5 with a distinct fold; the petiole, except a narrow, smooth, shining spot at the extreme apex, is finely rugulose, the second and following segments are coriaceous, the second and third segments being also more or less punctate basally, the second with some irregular elevated lines extending into the gastrocœli and some finer elevated lines extending from them.

Type.—Cat. No. 5534, U. S. Nat. Museum. From Sitka, June 16; Juneau, July 25. Two specimens. The species, except in the color

of the face and coxæ, and in size, superficially resembles *Automelus nigropilosus*.

ICHNEUMON SITKENSIS sp. nov.

Male.—Length 9 to 10.5 mm. Black and shining; the head above, especially close to the eye margins and the thorax above are coriaceous, subopaque and finely punctate, the mesopleura shining, closely punctate, becoming rugulosely punctate toward hind margins, the metathorax rugulose, the posterior face with irregular, elevated transverse lines; flagellum black; face below insertion of antennæ, an orbital line above, an orbital line on the lower hind orbits, scape beneath, palpi, an abbreviated line in front of the tegulæ and a line below, apices of the front and middle coxæ, and their trochanters, ivory or yellowish-white; ocelli pale; scutellum and postscutellum yellow; legs red with the coxæ and trochanters, except as noted, black; the anterior and middle tibiæ paler, yellowish or brownish-yellow, the anterior and middle coxæ at apex and their trochanters whitish, the tip of hind tibiæ and more or less of their tarsi fuscous. Wings hyaline, the stigma and veins brown, the disco-cubital vein not broken by a stump of a vein. The metathoracic areola is quadrate or nearly so, very slightly wider than long, the anterior angles of same being slightly rounded, the basal lateral and middle lateral areas are confluent, while the apical areas are complete. The abdomen is elongate, about twice longer than the head and thorax united, the first segment, or the petiole, being finely rugulose at apex, the second, third and fourth segments, subopaque, finely coriaceous, those beyond smoother, shining, at the most feebly alutaceous, while the gastrocœli are transverse and separated from each other by a small space.

Type.—Cat. No. 5535, U. S. Nat. Museum. From Sitka, June 16. One specimen.

ICHNEUMON KINCAIDI sp. nov.

Male.—Length 10 mm. Closely resembles *I. sitkensis* and easily confused with it but for the following differences: There is a yellow spot at the summit of eyes, on the lower hind orbit and on the middle of the superior margin of the pronotum; the antennæ, except a yellowish spot on joints 15 and 16 *above*, are black, the scape not white beneath, all coxæ and trochanters and the hind femora are black, although the front coxæ *beneath* and the trochanters at apex *narrowly* are white; rest of legs, except the tibial spurs which are white and the apices of hind tibiæ and tarsi, which are blackish or fuscous, red.

Wings faintly dusky, the disco-cubital nervure broken by a stump of a vein a little before its middle. The metathoracic areola is as in *I. sitkensis* except that the basal lateral and the middle lateral areas are separated, not confluent.

Type.—Cat. No. 5536, U. S. Nat. Museum. From Virgin Bay, June 26. One specimen.

ICHNEUMON SIMULATOR sp. nov.

Male.—Length 9 mm. Closely resembles and easily confused with both *I. sitkensis* and *I. kincaidi* but for the following differences: The flagellum is ferruginous beneath for three-fourths its length; the mesothoracic areola is large, quadrate, the surrounding carinæ being poorly defined, the posterior carina being sinuate medially; the basal lateral and middle lateral areas are wholly confluent without even a trace of the dividing carina; the legs are rufous with all coxæ and trochanters, except the second joint of the hind trochanters, black, the apical half of the hind tibiæ and their tarsi, which are black or fuscous; while the abdomen has a spot at apex of the first segment and the extreme apices of the second and third segments narrowly, testaceous.

Type.—Cat. No. 5537, U. S. Nat. Museum. From Kukak Bay, July 4. One specimen.

ICHNEUMON CERVULUS Provancher.

Ichneumon cervulus PROVANCHER, Nat. Can., VII, p. 83, ♂, 1875.—PROVANCHER, Fn. ent. du Can. Hym., p. 282, 1883.—CRESSON, Syn. Hym. North Am., p. 184, 1887.

Type in collection of the American Entomological Society. From St. Paul Island, August 16; Belkofski, July 22 (Fur Seal Commission).

ICHNEUMON KODIAKENSIS sp. nov.

Male.—Length 13 mm. Black, punctate; face below the insertion of the antennæ, except a small median spot basally and the surface surrounding the clypeal spiracles, the scape beneath, a small stripe on tegulæ and a line in front and below, the scutellum, second joint of trochanters, the anterior femora at apex and beneath, apex of middle femora, all tibiæ and tarsi, except the hind tibiæ at apex and the apices of joints of hind tarsi 1 to 4 and the fifth joint, lemon-yellow; abdominal segments 2 and 3, except the basal half of the first mentioned and a narrow stripe at base of the third, yellow. Wings subfuscous, the veins brown-black, the stigma within and the poststigmatal or postmar-

ginal vein brownish-yellow, the disco-cubital nervure not broken by a stump of a vein, the second recurrent nervure joining the areolet a little before its middle. The metathoracic areola is large, quadrate or nearly so, a little wider than long, with the anterior angles slightly rounded, the basal lateral and middle lateral areas distinctly separated.

Type.—Cat. No. 5538, U. S. Nat. Museum. From Kodiak, July 20. One specimen.

ICHNEUMON POPOFENSIS sp. nov.

Male.—Length 9.5 to 10 mm. Black and shining, although punctate; the front orbits have a narrow yellow line extending from a little below the middle of the face to near the summit of the eyes; the apical half, or more, of the mandibles, the scutellum, the legs, except coxæ and trochanters, and abdominal segments 2 and 3 and sometimes a lateral spot on 4, are red. Wings hyaline, or only faintly tinged, the stigma and veins brown, the disco-cubital vein with only a slight trace of a stump of a vein, while the second recurrent nervure joins the areolet at its middle. The metathoracic areola is large, quadrate, while the basal lateral and middle lateral areas are confluent. The abdomen is about twice as long as the thorax, the petiole aciculate at apex, dorsal segments 2 to 4 closely punctate, the following segments smoother, feebler, more sparsely and less distinctly punctate, while the gastrocœli are transverse, the space before each being striate.

Type.—Cat. No. 5539, U. S. Nat. Museum. From Popof Island, July 8. Two specimens.

ICHNEUMON GLACIALIS sp. nov.

Male.—Length 8 mm. Resembles *I. popofensis* and easily confused with it but for the following differences: The face below the insertion of the antennæ and a spot on scape beneath are lemon-yellow, not black; the palpi are yellowish-white: the apices of the hind femora and tibiæ are black; the first segment of the abdomen at apex, as well as the second and third, is red; the metathoracic areola is large, quadrate, but considerably broader than long; the second abdominal segment is only sparsely and feebly punctate at base, the following segments being smooth, the extreme apices of the third and fourth being testaceous; while the wings are subfuscous, the disco-cubital vein broken by a stump of a vein, the second recurrent nervure joining the areolet a little beyond the middle.

Type.—Cat. No. 5540, U. S. Nat. Museum. From Juneau, July 25. One specimen.

ICHNEUMON WILSONI (Cresson).

Ischnus wilsoni CRESSON, Proc. Ent. Soc. Phila., II, p. 188, 1864.

Ichneumon wilsoni CRESSON, Trans. Am. Ent. Soc., VI, p. 161, 1877.—

CRESSON, Syn. Hym. North Am., p. 189, 1887.

Type in collection of the American Entomological Society. From Seldovia, July 21; Juneau, July 25. Six specimens.

ICHNEUMON BREVIPENNIS Cresson.

Ichneumon brevipennis CRESSON, Proc. Ent. Soc. Phila., III, p. 174, 1864.—

CRESSON, Trans. Am. Ent. Soc., VI, p. 182, 1877.—CRESSON, Syn.

Hym. North Am., p. 183, 1887.

Type in collection of the American Entomological Society. From Muir Inlet, June 11 (Fur Seal Commission); Kukak Bay, July 4; Yakutat, June 21; Virgin Bay, June 26. Five females and three males.

Genus *Melanichneumon* Thomson.

MELANICHNEUMON SELDOVIÆ sp. nov.

Male.—Length 10 mm. Black; face below insertion of antennæ, mandibles, scape beneath and the palpi except first three joints of labial palpi, and the first joint and base of second joint of maxillary palpi ivory white; first three joints of labial palpi and the first joint and apex of second joint of maxillary palpi fuscous, the second joint of the last mentioned being much dilated apically; flagellum pale brownish beneath, with an annulus, joints 13 to 15 being yellowish-white; scutellum and postscutellum yellow; legs rufous, with the coxæ and first joint of trochanters except sutures, black, the hind tibiæ toward apex and their tibiæ, fuscous. Wings hyaline, the disco-cubital vein not distinctly broken by a stump of a vein, the arcolet irregularly pentagonal, the second recurrent nervure joining it before the middle. The metathoracic areola is hexagonal, the basal lateral and the middle lateral areas partly confluent, the transverse carina dividing them being distinct only at base, while the lateral apical areas are wanting.

Type.—Cat. No. 5541, U. S. Nat. Museum. From Seldovia, July 21. One specimen.

This species, without the closest attention to its generic characters, could easily be confounded with *Ichneumon imitator*, *I. sitkensis* and *I. kincaidi*.

Genus *Cratichneumon* Thomson.

This genus, not hitherto reported from North America, is represented in Alaska by five species, all new, distinguishable as follows :

TABLE OF SPECIES.

- Mostly *rufous* or ferruginous, or at least with mesonotum or scutellum *rufous*..... 3
- Mostly *black*, or head and thorax *black*.
 Abdomen mostly *rufous* or ferruginous..... 2
 Abdomen entirely *black*.
 Face below antennæ, spot on orbits at summit of eyes, and line opposite insertions of antennæ, white; legs ferruginous, with coxæ, first joint of trochanters, hind femora, and apices of their tibiæ *black*.
 Male..... *C. alaskensis*.
2. Face and antennæ wholly *black*; abdomen at apex *black*, segments 1 to 3 and 4 except at apex, *red*; legs *black*, with apices of anterior and middle femora, their tibiæ and tarsi and hind tibiæ, except at apex, and their tarsi, *reddish-yellow*. Male... .. *C. Kodiakensis*.
 Face below antennæ, anterior orbits, dot at summit of eyes, scape beneath, tegulæ, an abbreviated line in front of them, the tibial spurs, and front and middle coxæ and trochanters, *ivory* or *yellowish-white*; flagellum, except above, rest of legs, except first joint of hind trochanters and hind tarsi, which are *fuscous*, and abdomen, except the first segment, *rufous* or *ferruginous*. Male..... *C. yakutatensis*.
3. Mostly *rufous* or *ferruginous*..... 4
 Mostly *black*, with mesonotum, scutellum and abdomen, except first segment, more or less basally, *rufous*, rarely with the metathorax marked with *rufous*; face, below antennæ, scape beneath, palpi, a short line on upper margin of prothorax in front tegulæ, a spot *vis-à-vis* on lower margin, front coxæ and trochanters, *yellowish-white*.
C. confusus.
4. Thoracic sutures strongly marked with *black*.
 Metathorax entirely *black*; flagellum *incrassated*, *black*, with a *yellowish* annulus near the middle, the first three joints only a little longer than thick, those beyond *transverse*; legs and abdomen, except most of the petiole, *rufous*. Female..... *C. popofensis*.
 Metathorax *rufous*; face below antennæ, orbits, scape beneath and front coxæ beneath, *yellowish-white*; legs, except front trochanters, middle coxæ and trochanters, more or less, apices of hind coxæ, first joint of their trochanters, extreme apex of their femora, tips of hind tibiæ and their tarsi, which are *blackish* or *fuscous*, *red*; abdomen entirely *red*. Male..... *C. popofensis*.

CRATICHNEUMON ALASKENSIS sp. nov.

Male.—Length 8 mm. Black shining, the head and thorax punctate; face below insertion of antennæ, mandibles, palpi, and an abbreviated line in front of the tegulæ, ivory white; legs, except coxæ, trochanters, and hind femora, mostly ferruginous, the front femora beneath, the middle femora basally, apex of the hind tibiæ and hind tarsi being black or fuscous; tibial spurs whitish. Wings hyaline, the stigma and veins brown, the disco-cubital vein simple, not broken by a stump of a vein, the second recurrent nervure joining the areolet beyond its middle, the sides of the areolet strongly converging above. The metathoracic areola is horse-hoof shaped, the basal lateral and middle lateral areas being distinctly separated.

Type.—Cat. No. 5541, U. S. Nat. Museum. From Kodiak, July 20. One specimen.

CRATICHNEUMON KODIAKENSIS sp. nov.

Male.—Length 15.5 mm. Black shining and punctate; labium, apical joints of labial palpi and last three joints of maxillary palpi, yellowish; mandibles except at base rufous; legs black, with the apices of the front and middle femora, their tibiæ and tarsi and the hind tibiæ, except at apex and their tarsi, reddish-yellow; abdominal segments 2 to 5, except the first apically, rufous. Wings subhyaline, the stigma, except the margins, brownish-yellow, the internal veins dark brown, the disco-cubital vein not broken by a stump of a vein, the areolet rather large, pentagonal, the second recurrent nervure joining it only slightly, hardly perceptibly, before its middle. The metathoracic areola is horse-hoof shaped, the basal lateral and the middle lateral areas being confluent. The abdomen is distinctly punctate, the punctuation on the second and third segments being closer and more distinct, on the following finer and less distinct, the second with some coarse elevated lines basally, the gastrocœli broad and widely separated, the apex of the petiole being longitudinally striate.

Type.—Cat. No. 5542, U. S. Nat. Museum. From Kodiak, July 20. One specimen.

CRATICHNEUMON YAKUTATENSIS sp. nov.

Male.—Length 7.5 to 8 mm. Head thorax and petiole of abdomen, except at apex, black; a dot at summit of eyes, the anterior orbits, face below antennæ, lower hind orbits and the cheeks, mandibles except teeth, palpi, scape beneath, tegulæ, an abbreviated line in front of

them, along the upper margin of the pronotum, and a short line beneath, tibial spurs, and the anterior and middle coxæ and trochanters, ivory or yellowish-white; rest of legs, except the base of hind trochanters, apices of hind tibiæ and tarsi which are black or fuscous, and the abdomen, red; scutellum and postscutellum yellow; ocelli whitish; flagellum ferruginous beneath. Wings hyaline, the stigma and veins, except the subcostal, median and submedian veins basally, being brown-black; the disco-cubital vein has only a trace of a stump of a vein, the areolet being irregularly pentagonal, the sides strongly convergent above, and receiving the second recurrent nervure very slightly beyond its middle. The head is feebly, sparsely punctate, the cheeks and temples being impunctate, thorax sparsely but more distinctly punctate, the metathorax rugulose, strongly and completely areolated, the areola horse-hoof shaped, wider than long. The abdomen is twice as long as the thorax, smooth and shining, the petiole very sparsely punctate, except at extreme apex where it is smooth and impunctate, second and third segments punctate, the second the more strongly punctate, the gastrocœli small and not very deeply impressed.

Type.—Cat. No. 5543, U. S. Nat. Museum. From Yakutat, June 21; Popof Island, July 11, two specimens.

CRATICHNEUMON CONFUSUS sp. nov.

Male.—Length 6 to 7 mm. Head, except anteriorly and the thorax except the mesonotum and scutellum, black; abdomen, except basal two-thirds of first segment, basal half or more of second segment, a broad band at base of third segment, and usually a very narrow band at base and apex of fourth segment, which are black, rufous or ferruginous; face below the insertion of the antennæ and extending more or less along the front orbits, cheeks and lower hind orbits, mandibles, except teeth, palpi, scape beneath, a short line in front of tegulæ and a spot or line beneath, a line on lower margin of the pronotum just above the prosternum and the tibial spurs, ivory or yellowish-white; sometimes the front and middle coxæ are also more or less whitish; flagellum black, broadly ferruginous beneath; legs rufous, with the hind tarsi fuscous. Wings hyaline, the stigma and veins, except the subcostal median and submedian veins basally, brown, the subcostal, median and submedian veins basally, being pale yellowish; the disco-cubital vein is broken by a small stump of a vein just beyond its middle; the areolet is irregularly pentagonal, the second recurrent nervure received beyond its middle.

The head and thorax above are sparsely punctate, the pleura being rugulose punctate, the metathorax more strongly rugulose, the wrinkles in the areas, and particularly in the petiolar area, which is very long, being transverse; the areola is horse-hoof shaped, the basal lateral and the median lateral areas being confluent. The abdomen is fully twice and sometimes more than twice longer than the thorax; the petiole is punctate and somewhat aciculate to slightly beyond the spiracle, the surface beyond being smooth or only faintly punctate; dorsal segments 2 and 3 alutaceous and also punctate, the punctuation of the second being more distinct and somewhat rugulose basally, the segments beyond smooth, impunctate.

Type.—Cat. No. 5544, U. S. Nat. Museum. From Yakutat, June 21; Orca, June 26. Several specimens.

This species mimics the male of *Ichneumon brevipennis* Cresson in color, and the metathoracic characters must be closely scrutinized or it may be easily confounded with it.

CRATICHNEUMON POPOFENSIS sp. nov.

Female.—Length 7 mm. Ferruginous; a frontal spot above antennæ, stemmaticum, occiput, prosternum, thoracic sutures, the transverse depression of the prothorax and metathorax entirely and base of petiole, black; flagellum brown black, with joints 8 to 11 more or less whitish or pale yellowish; palpi white; apex of hind tibiæ and more or less of hind tarsi, fuscous.

Stature similar to *Ichneumon brevipennis* Cresson, the head subquadrate, the antennæ stout, 26-jointed, the joints of the flagellum after the fourth, transverse, the first only about twice as long as thick, joints 2 to 4 gradually shortening, the fourth not longer than thick. Thorax smooth, sparsely punctate, the metathorax rugulose, the areola large, nearly horse-hoof shaped, the anterior lateral angles being obtuse, the basal lateral and middle lateral areas being confluent. The abdomen is hardly one and a half times as long as the head and thorax united; the petiole, except at apex, is finely rugulose, the second and third segments alutaceous and punctate, the punctures on the third being shallower and more sparsely distributed, the following segments being smooth, impunctate, the gastrocæli shallow and poorly defined; ovipositor subexserted, the sheaths black.

Male.—Agrees well with the female, except that the metathorax is ferruginous, except along the pectus, the flagellum being black above, ferruginous beneath, *without* an annulus, while the apices of coxæ,

first joint of trochanters and the extreme apices of hind femora and tibiae and hind tarsi, are fuscous.

Type.—Cat. No. 5545, U. S. Nat. Museum. From Popof Island, July 10. Two specimens.

Genus *Probolus* Wesmael.

PROBOLUS SUBDENTATUS sp. nov.

Male.—Length 8.5 mm. Rufous or ferruginous; the occiput, ocelli and space anteriorly to the insertion of the antennæ, the space surrounding the clypeal spiracles and the sutures of the thorax, black; front and hind orbits, a spot on each side of the clypeus, a spot at summit of eyes, and the palpi, yellowish-white. Wings hyaline or only faintly tinged, the costal vein anteriorly and the stigma brownish-yellow, the internal veins darker or brown.

The head and thorax are distinctly, rather closely punctate, the metathorax being rugulose. The sutures of the thoracic sclerites, the depression at base of scutellum, the mesonotal ridge extending on to the scutellum, the depressions at the insertion of the wings, the incision between the postscutellum and the metathorax, and the hind margin of the metathorax at base of coxæ and insertion of abdomen, are black. The dorsum of the metanotum is very short, the metathorax being obliquely truncate from just beyond its base, the upper hind angles subdentate, the carinæ very strong and forming complete areas, the areola in outline semicircular, the spiracles being elongate. The abdomen is longer than the head and thorax united; the petiole or first segment is rather coarsely rugulose, with a hump-like elevation at its apical third, its dorsum strongly bicarinate, the carinæ extending from base to apex; segments 2 and 3 rugoso-punctate, both, however, smooth toward apex, the gastrocoeli deep, transverse; fourth segment finely and sparsely punctate towards base, the segments beyond smooth or nearly so, at most very sparsely and microscopically punctate.

Type.—Cat. No. 5546, U. S. Nat. Museum. From Kukak Bay, July 4. One specimen.

PLATYLABUS INCABUS Davis.

Platylabus incabus DAVIS, Trans. Am. Ent. Soc., xxiv, p. 352, ♀, 1897.

Male.—Length 8.5 mm. Agrees fairly well with Davis's description of the female except as follows: The anterior orbits have a faint much abbreviated white line opposite but a little *above* the insertion of the antennæ and an abbreviated but more distinct white line on the

hind orbits; the antennæ, except a yellowish-white spot on joints 14 and 15, are wholly black; the legs are red, with the coxæ slightly at base, hind tibiæ toward apex and their tarsi *faintly*, fuscous or blackish; while the abdomen is alutaceous and feebly but distinctly punctate, especially on segments 2 and 3, the punctuation of the fourth segment very faint, the fifth and beyond alutaceous, impunctate, the petiole rugulose its entire length except a narrow transverse, smooth, shining spot at the extreme apex of the middle lobe, or space between the dorsal carinæ.

From Popof Island, July 6.

This species was originally characterized by Mr. Davis from a single female, taken by Professor Aldrich, at Moscow, Idaho.

PLATYLABUS CALIFORNICUS Cresson.

Platylabus californicus CRESSON, Proc. Acad. Nat. Sci. Phila., p. 357, 1878.—
CRESSON, Trans. Am. Ent. Soc., VI, p. 201, 1877.—CRESSON, Syn.
Hym. North Am., p. 191, 1887.

Type in collection of the American Entomological Society. From Kukak Bay, July 4. One female.

Tribe PHÆOGENINI.

Genus *Centeterus* Wesmael.

CENTETERUS DORSATOR sp. nov.

Male.—Length 6 mm. Head, except face, upper orbits and a spot back of the ocelli, the antennæ, prosternum, mesosternum, anterior margin of the mesopleura, metathorax entirely, sutures of thorax above, petiole of abdomen, except at apex, and the middle and hind coxæ beneath, black; the lines on front orbits and the spot back of ocelli lemon-yellow; rest of body ferruginous, except that the first joint of the middle and hind trochanters, tips of hind tibiæ and their tarsi, and lateral blotches on dorsal abdominal segments 2 to 4 are fuscous.

The head is subquadrate, the temples broad, apparently smooth and impunctate, although with a strong lens the frontal depression is seen to be alutaceous. The thorax is smooth and shining, but with some sparse, minute punctures scattered over its surface, the metathorax being finely rugulose, the areola quadrate, open towards the base, the basal lateral and middle lateral areas confluent. The abdomen is longer than the head and thorax united, smooth and impunctate, except that the petiole and the second segment under a strong lens, are seen to have a very fine, coriaceous sculpture.

Type.—Cat. No. 5547, U. S. Nat. Museum. From St. Paul Island (Fur Seal Commission).

Genus *Eriplatys* Förster.

ERIPLATYS SITKENSIS sp. nov.

Female.—Length 4 mm. Head, scape of antennæ, thorax, hind coxæ and first segment of abdomen, black; mandibles, legs and rest of the abdomen, ferruginous; flagellum brown-black, with the first joint, the pedicel and ring-joint narrowly yellowish at apex. Wings hyaline, the stigma and veins light brown. The antennæ are rather stout, 22-jointed, thickened and convoluted toward apex, the scape very large, subglobose, obliquely truncate at apex, the first three joints of the flagellum obconic, subequal, hardly twice as long as thick at apex, the following shorter, joint 11 and beyond to last being transverse, the last cone-shaped. The head and thorax above are smooth and polished, or at most with a few, sparse, minute punctures scattered over the surface, the face and mesopleura more distinctly punctate, the metathorax rugulose and completely areolate, the areola hexagonal. The abdomen is pointed at apex and a little longer than the head and thorax united, smooth and polished, excepting that the surface of the petiole, the second dorsal segment and the third to a slight extent, if examined under a strong lens, appear very finely coriaceous, the thyridia on the second being represented by faint transverse depressed lines near the base.

Type.—Cat. No. 5548, U. S. Nat. Museum. From Sitka, June 16. One specimen.

Subfamily *CRYPTINÆ*.

Tribe *STILPNINI*.

Genus *Xestophya* Förster.

XESTOPHYA POLITA sp. nov.

Female.—Length 1.8 to 2 mm. Polished black, impunctate except the sides of the thorax and the abdomen, which are sometimes dark rufo-piceous, sometimes more or less yellowish basally. Antennæ 16- to 17-jointed (the last joint sometimes indistinctly articulated or closely united with the preceding), the flagellum is subclavate, brown-black, the first joint with an annulus at base and the pedicel yellow. Legs black or piceous black, with the sutures of the trochanters, extreme apices of femora and all tibiæ and tarsi, except the last joint, yellow. Wings hyaline, with the stigma and veins brownish-yellow or pale

yellow. The metathorax is incompletely areolated, the areola and the petiole area confluent, the lateral apical areas complete, the basal lateral and the middle lateral areas being represented by a single large area.

The abdomen varies from black to rufo-piceous, the petiole usually rufous and finely, longitudinally aciculated at apex, about thrice as long as wide; the body of abdomen viewed from above is oblong-oval or obovate, viewed from beneath it is seen to be compressed at apex; the whole surface is highly polished, impunctate, segments 1 to 3 (or 2 to 4, counting the petiole as the first) occupying most of the surface, the first the longest segment; ovipositor exerted but not as long as the basal joint of hind tarsi.

Male.—Length 1.5 to 1.8 mm. Agrees very well with the female except that the antennæ are longer, filiform, not thickened toward apex, and always 19-jointed; the abdomen is clavate, the petiole much longer and black, the body being pear-shaped, the two basal segments and sometimes the third are usually rufous, while the tibiæ are embrowned; palpi yellowish.

Type.—Cat. No. 5549, U. S. Nat. Museum. From St. Paul Island, August 15 (Fur Seal Commission). Eight specimens.

XESTOPHYA NIGRIPES sp. nov.

Male.—Length 2.5 mm. Wholly black, except as follows: An annulus at base of first joint of the flagellum, tibial spurs, sutures between the trochanters and base of femora, the extreme apex of front femora, their tibiæ at base and beneath and their tarsi, pale yellowish, rest of legs and the palpi black. Wings hyaline, the stigma and veins light brownish.

Type.—Cat. No. 5550, U. S. Nat. Museum. From St. Paul Island, August 15 (Fur Seal Commission). One specimen.

Genus *Asynocrita* Förster.

ASYNOCRITA sp.

From Unalaska. A single specimen too badly broken for describing.

Genus *Exolytus* Holmgren.

This genus is probably parasitic upon dipterous larvæ and is well represented in all boreal regions, though comparatively few have been described in the North American fauna. There are now known from Alaska eleven species (*sens. lat.*) which may be recognized by the use of the following table.

TABLE OF SPECIES.

1. Species *not mostly black*, the clypeus pale yellow or the abdomen is more or less red or banded with red. 7
 Species *mostly black* or the head, thorax and abdomen are black.
 Antennæ 20-jointed or less. 4
 Antennæ more than 20-jointed. 2
2. Antennæ less than 24-jointed. 3
 Antennæ 24-jointed.
 Legs mostly black, the sutures of trochanters, knees, tibiæ *sometimes* beneath, tibial spurs, and apices of tarsal joints testaceous. Male.
 E. perplexus.
3. Antennæ 21-jointed; legs more or less black, all coxæ always black.
 Antennal joints 19 to 20, not longer than thick; tips of anterior and middle femora, their tibiæ and tarsi and the hind tibiæ testaceous; hind tarsi fuscous. Male. *E. popofensis*
 Antennal joints 12 to 20, about equal, all a little longer than thick; anterior and middle legs (except more or less of middle femora basally, rarely the anterior femora basally), and hind tibiæ testaceous. *E. niger.*
4. Antennæ 19-jointed. 6
 Antennæ 20-jointed.
 Front and middle coxæ, except the middle sometimes at base, pale ferruginous or yellowish. 5
 All coxæ black.
 Legs mostly black, the sutures of trochanters, the knees, tibial spurs and apices of tarsal joints testaceous; sometimes most of the front femora, apices of middle femora, all tibiæ and the anterior and middle tarsi are testaceous; antennal joints 13 to 19, a little longer than thick. Male. *E. sanctipauli.*
5. Legs mostly pale ferruginous, with the hind pair, except their tibiæ basally, black, the front and middle tarsi subfuscous; antennal joints 16 to 19 very little longer than thick. Female. *E. ungæ.*
 Legs ferruginous, with the first joint of hind trochanters and basal two or three joints of hind tarsi, subfuscous; antennal joints 16 to 19 about twice as long as thick. Female. *E. alaskensis.*
6. Legs mostly black, with the sutures of trochanters, knees, hind tibiæ, except apically, and the extreme apices of tarsal joints, testaceous; antennæ black, shorter than in previous species, joints 6 and 7 a little longer than thick, joints 8 to 18 quadrate, not longer than thick. Female. *E. kincaidi.*
 Legs mostly black, with the sutures of trochanters, knees and all tibiæ, flavo-ferruginous, the tarsi more or less fuscous; antennal joints 6 to 9 more than twice longer than thick, joints 10 to 18 all longer than thick. Female. *E. insularis.*

median and submedian veins in the hind wings, yellow; areolet open behind. The lateral depressions of the scutellum, the mesopleura superiorly, just beneath the insertion of the wings, and the petiole of the abdomen, are striated.

Type.—Cat. No. 5563, U. S. Nat. Museum. From St. Paul Island, August (Fur Seal Commission). Three specimens.

EXOLYTUS POPOFENSIS sp. nov.

Female.—Length 6 mm. Polished black, impunctate, the mesopleura superiorly beneath the insertion of the wings and the petiole of the abdomen not striated; pedicel at apex and the ring-joint flavotestaceous; legs more or less black, with the sutures of trochanters, tips of front and middle femora (the former almost wholly beneath), their tibiae and tarsi and the hind tarsi, testaceous; hind tarsi fuscous, the joints of the anterior and middle tarsi are also sometimes more or less subfuscous. Antennae 21-jointed. Wings hyaline, the stigma and veins brown, as in *E. perplexus*.

Male (?)—Length 4 mm. Agrees well with the female, except that the mesopleura beneath the wings and the petiole of the abdomen are coriaceous and not perfectly smooth and polished as in the opposite sex.

Type.—Cat. No. 5564, U. S. Nat. Museum. From Popof Island, August (Fur Seal Commission).

EXOLYTUS NIGER Ashmead.

Exolytus niger ASHMEAD, Fur Seals and Fur Seal Islands, Pt. IV, p. 338, ♀, 1899.

Type.—Cat. No. 4041, U. S. Nat. Museum. From Bering Island (Dr. Stejneger); Alaska, Pribilof Islands (F. A. Lucas).

EXOLYTUS SANCTIPAULI sp. nov.

Female.—Length 4 to 4.5 mm. Polished black and in color and sculpture is very nearly a counterpart of *E. perplexus* from which it may, however, be easily distinguished by having only 20-jointed antennae, by the areolet in the front wings being closed by an hyaline, although distinct, vein, and by the less distinctly striated petiole of the abdomen. Two or three of the specimens have the legs colored as in *E. popofensis*.

Type.—Cat. No. 5565, U. S. Nat. Museum. From St. Paul Island, July 21 (Fur Seal Commission); Popof Island, July 9, 10.

EXOLYTUS UNGÆ sp. nov.

Male and Female.—Length 3 to 3.5 mm. Polished black, impunctate; an annulus at base of first joint of the flagellum, mandibles and legs, except as hereafter noted, pale ferruginous or yellowish; base of middle coxæ and hind legs, except sutures of trochanters, basal two-thirds of their tibiæ and the tibial spurs, black; all tarsi fuscous or subfuscous *sometimes*; palpi and tegulæ yellowish-white. Antennæ 20-jointed. Wings hyaline, the stigma and veins brown, the areolet open behind, the transverse median nervure interstitial, *or very nearly*. The mesopleura beneath the wings and the petiole of the abdomen are impunctate although the latter sometimes exhibits a faint alutaceous sculpture, more noticeable in the male.

Type.—Cat. No. 5566, U. S. Nat. Museum. From Unga, July 21; Unalaska, August 24.

EXOLYTUS ALASKENSIS sp. nov.

Female.—Length 5.5 mm. Polished black, impunctate; palpi and tegulæ yellowish-white, legs, except the hind coxæ and the first joint of their trochanters, pale ferruginous or brownish-yellow. Antennæ 20-jointed. Wings hyaline, the stigma and veins brown, the areolet closed but the closing vein is hyaline, nearly obsolete, so that without care one might easily take it to be open. Abdomen much elongate, twice longer than the thorax, the petiole smooth except towards the base, where it is feebly alutaceous.

Type.—Cat. No. 5567, U. S. Nat. Museum. From Popof Island, July 8. One specimen.

EXOLYTUS KINCAIDI sp. nov.

Female.—Length 4.5 mm. Polished black, with the transverse depressions at sides of the prothorax, the depressions at sides of scutellum and mesopleura superiorly just beneath the wings, lineated; the petiole of the abdomen has a slight median furrow at its apex and some feeble lineations on either side of the furrow. Mandibles and palpi black. Antennæ 19-jointed. Wings hyaline, the stigma and veins brownish, the areolet closed by an hyaline nervure, while the recurrent nervure at apex and the disco-cubital nervure beyond the middle are broken by *bullæ*.

Type.—Cat. No. 5568, U. S. Nat. Museum. From St. Paul Island, August 15 (Fur Seal Commission).

EXOLYTUS INSULARIS sp. nov.

Female.—Length 4 mm. In color very similar to *E. kincaidi* and agreeing with it also in having 19-jointed antennæ but readily separated by the differences brought out in the table of species—color of legs and relative length of antennal joints—and the following differences: The depressions at the sides of the pronotum are not lineated, the apex of the clypeus and the mandibles are rufous, the labial palpi yellowish, while the petiole of abdomen is smooth and without the median furrow at apex.

Type.—Cat. No. 5569, U. S. Nat. Museum. From Popof Island, July 10. One specimen.

EXOLYTUS CLYPEATUS sp. nov.

(Pl. ix, fig. 5.)

Female.—Length 6 mm. Polished black, with the clypeus, mandibles, except teeth, palpi at base, tegulæ, a spot in front of it, the apices of front and middle coxæ, all trochanters, except more or less of the first joint *above*, tibial spurs and the ventral fold of abdomen, ivory or yellowish-white; rest of legs pale ferruginous or yellowish, the middle femora basally brownish, the middle and hind coxæ and the hind femora mostly black. Antennæ 24-jointed, the flagellum ferruginous. Wings hyaline, the stigma and costal vein brownish, the internal veins paler, the areolet open, without a vestige of the second transverse cubitus. Abdomen very long, compressed more than twice longer than the head and thorax united, the petiole feebly coriaceous with the spiracles placed before its middle.

Type.—Cat. No. 5570, U. S. Nat. Museum. From Popof Island, July 11. One specimen.

EXOLYTUS SELDOVIÆ sp. nov.

Male.—Length 5.5 mm. Black, with the mandibles, legs, except hind coxæ, the apex of the second dorsal abdominal segment and the base of the third dorsal segment, red or rufo-testaceous; palpi, tegulæ and front coxæ and trochanters pale yellowish. Antennæ 23-jointed. Wings hyaline, the stigma and veins brown, the epitegulæ, subcostal vein and the veins in the hind wings toward base, pale yellowish; areolet closed by an hyaline vein. Abdomen polished, shining, the petiole elongate, lineated at the sides.

Type.—Cat. No. 5572, U. S. Nat. Museum. From Seldovia, July 4. One specimen.

EXOLYTUS RUBROCINCTUS sp. nov.

Male.—Length 6.5 mm. Polished black; palpi yellowish; the third dorsal abdominal segment, except sometimes at apex, ventral segments 2 and 3 and the legs, except coxæ, basal joint of trochanters, more or less of femora and the hind tarsi which are black, are red or rufo-testaceous. Antennæ 26-jointed. Wings hyaline, the stigma and veins brown, the epitegulæ and the subcostal vein pale yellowish, the areolet open.

Type.—Cat. No. 5571, U. S. Nat. Museum. From Popof Island, July 8. Two specimens.

EXOLYTUS UNGENSIS sp. nov.

Female.—Length 5 mm. Black; the tegulæ and legs pale ferruginous, the front and middle coxæ and trochanters yellowish; abdomen with the venter at apex and dorsal segments 2 and 3, except the former narrowly at base and the latter at apex, red. Antennæ? broken. Wings hyaline, the stigma and veins brown, the epitegulæ, subcostal, median and submedian veins pale yellowish. Abdomen smooth and polished, the petiole with a few irregular, longitudinal wrinkles, but not distinctly striated.

Type.—Cat. No. 5573, U. S. Nat. Museum. From Unga, July 21. One specimen.

Genus *Atractodes* Gravenhorst.

ATRACTODES YAKUTATENSIS sp. nov.

Male.—Length 3.5 mm. Black, coriaceously opaque; mandibles, sutures of trochanters and knees rufo-testaceous; tegulæ and tibial spurs pale yellowish. Wings hyaline, the stigma and veins brown, the areolet open behind.

The head is transverse, at least thrice as wide as thick antero-posteriorly, the temples only about half the width of the eyes, the eyes being large, oval. The metathorax is long, arcolated, the areola complete, hexagonal. The abdomen is scarcely the length of the thorax, finely coriaceous, the petiole striate, a little longer than the second segment.

Type.—Cat. No. 5574, U. S. Nat. Museum. From Yakutat, June 21. One specimen.

Tribe *PHYGADEUONINI*.Genus *Stibeutes* Förster.*STIBEUTES NIGRITA* Ashmead.

Stibeutes nigrata ASHMEAD, Fur Seals and Fur Seal Isl., Pt. IV, p. 338, ♀, 1899.

Type.—Cat. No. 3650, U. S. Nat. Museum. From St. Paul Island (Fur Seal Commission); Copper Island, Asia (Dr. L. Stejneger).

Genus *Stiboscopus* Förster.

In this genus should be placed *Stilpnus hudsonicus* Cresson, described from Hudson Bay Territory. It is well represented in our fauna and six species have been recognized in the Alaskan material, distinguishable by the aid of the following table.

TABLE OF SPECIES.

1. Species *ferruginous* 6
 Species *black* or at least with the head and thorax black.
 Abdomen entirely black or at most with only a slight piceous
 tinge on the second segment..... 2
 Abdomen not entirely black..... 4
2. Hind coxæ alone black, the front and middle coxæ ferruginous
 or only black basally..... 3
 All coxæ black.
 Legs mostly black, with the sutures of trochanters, tibiæ and the extreme
 apices of tarsal joints, dark rufous; antennæ 20-jointed, incrassate
 toward apex. Female..... *S. sanctipauli*.
3. Legs, except hind coxæ, ferruginous; antennæ 21-jointed, not incrassate
 toward apex. Female..... *S. alaskensis*.
4. Abdomen black, with the sutures 1 and 2 testaceous, the color
 sometimes extending more or less distinctly on the surrounding
 surface..... 5
 Abdomen black, with a narrow testaceous band at base of third
 segment.
 Antennæ 24-jointed; legs mostly black with sutures of trochanters,
 knees, tibiæ, except at apex, and the front and middle tarsi, flavo-tes-
 taceous. Male..... *S. solitarius*.

5. Hind coxæ black; anterior and middle legs ferruginous or reddish, the hind legs black or fuscous, their tibiæ more or less ferruginous basally.

Antennæ 23-jointed; abdomen with the petiole shagreened, the second and following segments smooth. Male..... *S. mandibularis*.

Antennæ 21-jointed, very long; abdomen with the petiole and the second segment finely shagreened, those beyond smooth. Male.

S. sitkensis.

6. Antennæ 25-jointed; sheaths of ovipositor black; wings hyaline, the costal vein and the stigma light brown or brownish-yellow, the subcostal vein and the internal veins dark brown. Male... *S. ferrugineus*.

STIBOS COPUS SANCTIP AULI sp. nov.

Female.—Length 2.5 mm. Polished black, the ovipositor about one-third the length of the abdomen, the sutures of the trochanters, tibiæ and the extreme apices of the tarsal joints dark rufous. Antennæ 20-jointed, thickened toward apex, the first joint of the flagellum only about two-thirds the length of the second. Wings subhyaline, the stigma and veins brown. The head is large, quadrate; the mesonotum on the disk is flat, the scutellum with a crenate furrow across the base; the metathorax is completely areolated, the areola nearly horse-hoof shaped. Abdomen polished, shining; the first segment is feebly coriaceous at sides and towards base, polished at apex, the second and third segments large, subequal, broader than long, the second a little longer than the first.

Type.—Cat. No. 5576, U. S. Nat. Museum. From St. Paul Island, August 15 (Fur Seal Commission). One specimen.

STIBOS COPUS ALASKENSIS sp. nov.

Female.—Length 3.4 mm. Polished black; legs, except the middle coxæ, basally and the hind coxæ ferruginous; antennæ 21-jointed, the first joint of the flagellum a little longer than the second, with a pale annulus at base. Wings hyaline, the stigma and veins yellowish. The head is transverse quadrate, the mesonotum feebly depressed posteriorly, the scutellum with a non-crenate furrow across the base, the metathorax areolated, the areola hexagonal, wider than long. Abdomen oblong-oval, similar to *S. sanctipauli*, except that the petiole or first segment is longitudinally striate.

Type.—Cat. No. 5577, U. S. Nat. Museum. From St. Paul Island, August 15 (Fur Seal Commission). One specimen.

STIBOSCOPUS SOLITARIUS sp. nov.

Male.—Length 3.5 mm. Black, the head above and the mesothorax, except the metanotum, polished, shining; abdomen with a narrow testaceous band at base of third; palpi and tegulæ yellowish-white; legs mostly black, with the sutures of the trochanters, knees, tibiæ, except at apex, and the front and middle tarsi, flavo-testaceous. Metathorax areolated, the areola hexagonal, longer than wide. Wings hyaline, the stigma and veins brown. Abdomen a little longer than the head and the thorax united, the first three segments finely coriaceous, opaque, the following smoother, the second segment a little longer than wide, the third a little wider than long.

Type.—Cat. No. 5578, U. S. Nat. Museum. From Popof Island, July 12. One specimen.

STIBOSCOPUS MANDIBULARIS sp. nov.

Male.—Length 4 mm. Polished black; abdominal sutures 1 and 2 testaceous; legs, except the hind tibiæ basally and the middle femora basally ferruginous. Antennæ 23-jointed, the first three joints of the flagellum subequal, the first scarcely longer than the second. Wings hyaline, the stigma and veins brown. Metathorax areolated, the areola hexagonal. Abdomen a little longer than the head and thorax united, polished, shining, except the petiole which is feebly wrinkled, subopaque, with two feeble, median dorsal carinæ toward base.

Type.—Cat. No. 5579, U. S. Nat. Museum. From St. Paul Island, August (Fur Seal Commission). One specimen.

STIBOSCOPUS SITKENSIS sp. nov.

Male.—Length 3.5 mm. Polished black; mandibles rufo-piceous; sutures 2 and 3 of abdomen and the legs, except hind coxæ, their femora, their tibiæ toward apex and their tarsi, ferruginous. Antennæ 21-jointed, the three or four basal joints of the flagellum elongate, the first the longest with a yellowish annulus at base. Metathorax areolated, the carinæ strongly elevated, the areola hexagonal, longer than wide. Wings hyaline, the stigma and veins light brown, the areolet irregularly pentagonal, receiving the second recurrent nervure much beyond its middle. Abdomen elongate, longer than the head and thorax united, the petiole and second segment shagreened, the following smooth and polished.

Type.—Cat. No. 5580, U. S. Nat. Museum. From Sitka, June 15. One specimen.

STIBOSCOPUS FERRUGINEUS sp. nov.

Female.—Length 7 mm. Ferruginous, the antennæ and legs paler, more of a brownish-yellow; head subquadrate, coriaceous, the eyes black. Antennæ 25-jointed, slightly thickened toward apex, the first and second joint of flagellum elongate, subequal. Wings hyaline or at most only faintly tinged, the stigma and veins brown, the areolet large, pentagonal, the sides nearly parallel. Metathorax incompletely areolated, the areola hexagonal, the lateral longitudinal carinæ and the basal and lateral median areas obliterated. Abdomen with the first three segments finely, uniformly coriaceous.

Type.—Cat. No. 5581, U. S. Nat. Museum. From Popof Island, July 9. One specimen.

Genus *Bathymetis* Förster.

This genus is well represented in North America. The following table will enable the student to separate the species found in Alaska:

TABLE OF SPECIES.

| | |
|--|-----|
| Species <i>rufous</i> or ferruginous..... | 26. |
| Species <i>black</i> or the head and thorax black..... | 2. |
| 2. Abdomen entirely black or at most with a piceous or testaceous tinge in one or more of the sutures..... | 3. |
| Abdomen not entirely black, either red or with one or more of the segments red or marked with red..... | 13. |
| 3. All coxæ black or black basally. | |
| Antennæ 20-jointed or less. (Male 24-jointed)..... | 8. |
| Antennæ 21-jointed or more..... | 4. |
| 4. Antennæ less than 24-jointed. (Female 20-jointed.) | |
| Antennæ 24-jointed. Male. (Female 20-jointed.) | |
| Legs black, with the sutures or more of trochanters, apices of front and middle femora, the front tibiæ and tarsi and the middle and hind tibiæ, except at apex, testaceous; first and second joints of the flagellum about equal, fully thrice as long as thick; abdomen one-third longer than the head and thorax united, the petiole stout, finely rugulose, not distinctly aciculate except along the sides. | |

B. nigricornis.

5. Antennæ 22-jointed or less.....6.
 Antennæ 23-jointed. (Female 19-jointed.)
 Legs black, with the sutures of trochanters, front and middle legs except femora basally, tips of hind femora and their tibiæ, except apex, rufo-testaceous.....*B. simillima*.
6. Antennæ 21-jointed. Male..... 7.
 Antennæ 22-jointed. Male. (Female 18-jointed.)
 Legs, except the anterior coxæ basally, the middle and hind coxæ, bases of front and middle femora and hind legs, except basal two-thirds of tibiæ which are black, ferruginous; abdomen with usually more or less of the third dorsal segment red, or the apex of the second and the base of the third segments are reddish. Male..... *B. confusa*.
7. Legs black with the sutures of trochanters, apices of femora, all tibiæ, except the hind pair at apex, and the anterior and middle tarsi more or less testaceous; first and second joints of flagellum subequal, the first slightly the longer with a pale annulus at base, about $3\frac{1}{2}$ times as long as thick; abdomen longer than the head and thorax united, the petiole finely rugulose to a little beyond the spiracles. Male.
B. ungæ.
8. Antennæ less than 20-jointed..... 11.
 Antennæ 20-jointed.
 Females 9.
 Males 10.
9. Legs black, with the sutures of the trochanters, apices of femora (the anterior usually entirely beneath), and the tibiæ, except the posterior at apex, dark rufous, the tarsi black or fuscous; pedicel testaceous at apex; metathoracic areola hexagonal, fully as long as wide or a little longer; first joint of flagellum only about two-thirds the length of the second, the third only a little shorter than the second, joints 5 and those beyond to the last, not, or scarcely, longer than thick, the last oblong.....*B. nigricornis*.
 Legs black with the apex of front coxæ, their femora, except slightly at base above, their tibiæ and tarsi, second joint of middle and hind trochanters, apices of their femora, middle tibiæ and tarsi and hind tibiæ, except at apex, rufo-testaceous; pedicel and first joint of flagellum at base, rufo-testaceous; metathoracic areole hexagonal, a little wider than long.
 First joint of flagellum about two-thirds the length of the second, the third only a little shorter than the second, joints 7 and 8, a little thicker than long, the following to the last a little longer than thick, the last joint oblong; petiole finely coriaceous.....*B. imitator*.
 First joint of flagellum only a little longer than thick at apex, usually two-thirds the length of the second, joints 5 and 6 quadrate, the following to the last a little longer than thick, the last oblong, nearly thrice as long as thick; petiole coriaceous to the spiracles and along the sides to beyond the spiracles.....*B. simulans*.

10. All coxæ black, the anterior sometimes testaceous at apex, rest of legs mostly black, with sutures of trochanters, tips of femora, tibiæ except hind pair, and the tarsi, except the posterior, dark rufous, the middle and front tarsi with the joints more or less fuscous basally; first and second joints of flagellum equal hardly or not more than thrice longer than thick at apex.

Metathoracic areola hexagonal but much *wider* than long; fovea at base of scutellum smooth, without striæ; antennal joints 13 to 19 distinctly longer than thick..... *B. quadriceps*.

Metathoracic areola hexagonal but *longer* than wide; fovea at base of scutellum with striæ; antennal joints 13 to 19 hardly longer than thick..... *B. simulator*.

11. Antennæ 18-jointed..... 12.
Antennæ 19-jointed.

Legs black, with the sutures of trochanters apices of femora and tibiæ except the posterior at apex rufo-testaceous, tarsi black or fuscous, the extreme tips of the anterior and middle tarsal joints (rarely entirely) and the apex of the antennal pedicels testaceous.

First joint of the flagellum only two-thirds the length of the second, joints 5 to 10 not longer than thick, the last oblong, thrice as long as thick; petiole of abdomen coriaceous or finely shagreened to the spiracles. Female..... *B. simillima*.

12. Legs black, with the sutures of trochanters, tips of femora, the front and middle tibiæ and tarsi and the hind tibiæ, except at apex, rufo-testaceous; third joint of antennæ obconical, only a little longer than thick at apex and much shorter than the fourth, joints 7-10 quadrate or nearly. Female. (Male 22-jointed antennæ.)..... *B. confusa*.

13. Abdomen not entirely red, always black at base and apex.... 14.
Abdomen, except sometimes the petiole or the petiole at base, entirely red or ferruginous..... 24.

14. Abdomen with dorsal segments 2 and 3 and sometimes 4, or at least basally or in the sutures, red..... 22.
Abdomen quite differently marked, dorsal segments 2 and 3 never both red..... 15.

15. Antennæ 23-jointed or less..... 17.
Antennæ 24-jointed. Male. (Female 20-jointed).... 16.

16. Abdomen with the second suture and extreme apex of the segment, and the base of third segment or the third wholly testaceous or dark rufous; rarely with base of fourth segment red; first and second joints of flagellum equal or very nearly, the penultimate joint very distinctly longer than thick. *B. rubrocincta*.

Abdomen with second suture including the extreme apex of the second segment and the apex of the third segment, testaceous (sometimes with only the second and third sutures testaceous); second joint of flagellum a little shorter than the first, the following imperceptibly shortening the penultimate joint being only a little longer than thick.

B. imitator.

17. Antennæ 22-jointed or less..... 18.

Antennæ 23-jointed. Male. (Female 19-jointed.)

Abdomen with the third segment dark rufous.....*B. simillima.*

18. Antennæ 21-jointed or less..... 19.

Antennæ 22-jointed. Males. (Female 18-jointed.)

Abdomen with the extreme apices of the second and the third segments testaceous.....*B. confusa.*

Abdomen with the apex of the second segment and the third entirely testaceous.....*B. confusa.*

19. Antennæ 20-jointed or less..... 20.

Antennæ 21-jointed. Female.

Abdomen with the apex of the second segment, second suture and the third segment basally, testaceous.....*B. ungæ.*

20. Antennæ 19-jointed or less..... 21.

Antennæ 20-jointed.

Females. (Male 24-jointed.)

Abdomen with base of second segment and the third more or less dark rufous.

Length 4 mm. Metathoracic areola horse-hoof shaped; areolet receiving the second recurrent nervure before its apical third.

B. rubrocincta.

Length 3 mm. Metathoracic areola hexagonal; areolet receiving the second recurrent nervure at its apical third.....*B. imitator.*

Males. (Female unknown.)

Length 3.5 mm. Third and fourth antennal joints equal, both a little longer than the fifth.....*B. quadriceps.*

Length 4 mm. or more. Third antennal joint a little shorter than fourth, but equal to the fifth.....*B. simulator.*

21. Antennæ 19-jointed. Female.....*B. simillima.*

Antennæ 18-jointed. Female.....*B. confusa.*

22. Antennæ 21-jointed or less.....23.

Antennæ 24-jointed. Male.

Abdomen black, with dorsal segments 2 and 3 red, and sometimes the apex of the first and the base or more of the fourth, red...*B. bicolor.*

23. Antennæ 21-jointed. Male.

None in this section known from Alaska.

Antennæ 19-jointed. Female. (Males 23-jointed.)

None in this section known from Alaska.

24. All coxæ red or pale, never black..... 25.
 All coxæ black.
 Antennæ 22-jointed. Female.
 None in this section known from Alaska.
 Antennæ 20-jointed. Female..... *B. bicolor*.
25. To this section belong *Phygadenon californicus* Cr., *P. crassipes* Prov. and *P. vulgaris* Cr.
26. None in this section are found in Alaska.

BATHYMETIS NIGRICORNIS sp. nov.

Female.—Length 3.5 mm.; ovipositor a little longer than the petiole. Polished black, the face sparsely punctate, the metathorax finely wrinkled and completely areolated; mandibles, except teeth, sutures of trochanters, knees and tibiæ, except the apex of the hind tibiæ, dark rufo-testaceous, the tarsi mostly fuscous, the anterior and middle tarsi with the apices of joints and beneath usually testaceous, rarely wholly testaceous; tegulæ and tibial spurs yellowish-white. Wings hyaline, the stigma and veins dark brown. Head quadrate, the temples full, broader than the eyes. Antennæ 20-jointed, slightly thickened toward the apex, the second and third joints of the flagellum subequal, about one-half longer than the first, the joints beyond, to the last, shorter joints 5 and 6 quadrate or nearly so, the following to the last a little wider than long, the last oblong, a little more than twice longer than thick.

Male.—Length 5 mm. Agrees well with the female except in the usual sexual differences. The head is subquadrate, the abdomen longer, clavate, one-third longer than the head and thorax united, the petiole finely rugulose, longitudinally aciculated at sides, while the antennæ are 24-jointed, the flagellum being filiform, the first and second joints of same subequal in length, or at most, with the first very slightly the longer.

Type.—Cat. No. 5582, U. S. Nat. Museum. From St. Paul Island (Fur Seal Commission).

BATHYMETIS IMITATOR sp. nov.

Female.—Length 2.8 to 3 mm.; ovipositor not longer than the petiole. Polished black, the base below the antennæ sparsely punctate, the space above flat or depressed and smooth; legs black, with the apices of front coxæ, their femora, except slightly basally above, their tibiæ and tarsi, second joint of middle and hind trochanters, apices of their femora, middle tibiæ and tarsi and the hind tibiæ, except at apex,

rufo-testaceous. Metathorax with the areola hexagonal, a little wider than long. Abdomen black, with the second segment at base and the second suture usually testaceous.

The antennæ are 20-jointed, incrassated toward apex, black, with the pedicel, and first joint of the flagellum, testaceous; the first joint of the flagellum is about two-thirds the length of the second, the third only a little shorter than the second, joints 7 and 8 a little wider than long, the following to the last a little longer than thick, the last joint being oblong.

Male.—Length 3.5 to 3.8 mm. Resembles *B. nigricornis* and agrees with it closely, except slightly in color and in two or three slight structural characters: The antennæ are 24-jointed, a little slenderer, with the first joint of the flagellum a little longer than the second: the palpi and tegulæ are yellowish-white; the legs are black, with the second joint of trochanters, the femora at apex (the front pair very broadly), the tibiæ, except the hind pair at apex, and the tarsi, except the posterior, rufo-testaceous; apices of hind tibiæ and their tarsi black or fuscous; while the abdomen is black with the first suture and the margins of the segments surrounding it, and the apex of the second segment, testaceous.

Type.—Cat. No. 5584, U. S. Nat. Museum. From St. Paul Island (Fur Seal Commission).

BATHYMETIS SIMULANS sp. nov.

Female.—Length 5 mm. Polished black; mandibles and legs, except the middle coxæ basally, the hind coxæ, first joint of trochanters, anterior and middle femora basally, the hind femora, apices of their tibiæ and their tarsi, which are black, rufo-testaceous; face below antennæ punctate, the clypeus well separated with some sparse punctures; palpi and tegulæ yellowish-white. Antennæ 20-jointed. Wings hyaline, the stigma and veins, except the median and submedian veins basally which are yellowish, brown-black; the areolet is irregularly pentagonal, the recurrent nervure joining it beyond the middle. Abdomen black, with the apex of the petiole and the lateral membranous part and the second suture testaceous.

Type.—Cat. No. 5585, U. S. Nat. Museum. From St. Paul Island, August 15 (Fur Seal Commission).

BATHYMETIS RUBROCINCTA sp. nov.

Female.—Length 4.5 mm.; ovipositor only two-thirds the length of the petiole. Polished black, the face below the antennæ closely

punctate; palpi subfuscous; mandibles and legs mostly rufo-testaceous, a blotch on first joint of trochanters and front and middle femora basally, fuscous, the hind femora, except at apex, their tibiae at apex and their tarsi black; tegulae yellowish-white. Antennae 20-jointed, black, the pedicel testaceous at apex; flagellum imperceptibly thickened towards apex, the first joint obconical, less than two-thirds the length of the second, the third joint, if anything, very slightly longer than the second or fully as long, joints 4 and 5 a little longer than thick, 6 to last a little wider than long, the last fusiform, longer than thick at base. The metathorax is completely areolated, the areola hexagonal. Wings hyaline, the stigma and veins brown, the areolet receiving the second recurrent nervure beyond its middle. Abdomen oblong-oval, with the petiole rather long, segments 2 and 3 more or less dark rufous, sometimes obfuscated or dusky across the middle, or with only the sutures and basis of segments testaceous; body of abdomen smooth and highly polished, the petiole finely shagreened.

Male.—Length 4 mm. Black, with the legs colored as in female, the abdomen with the third segment more or less dark rufous, sometimes wholly rufous, the second suture testaceous. Antennae 24-jointed, the first and second joints of the flagellum equal or very nearly, about twice as long as thick.

Type.—Cat. No. 5586, U. S. Nat. Museum. From Sitka, June 16; St. Paul Island, August (Fur Seal Commission).

BATHYMETIS SIMILLIMA sp. nov.

(Pl. x, fig. 1.)

Female.—Length 2.5 to 3 mm. Polished black and colored as in *P. simulans* but distinguished by the antennae, which are 19-jointed, not 20-jointed.

The flagellum is obscure rufous basally, the first joint two-thirds the length of the second, the third joint scarcely shorter than the second, joints 5 to 10 not longer than thick.

The abdomen is most frequently entirely black, although sometimes one or two of the sutures, and the surrounding surface, or the apices of one or two of the segments are testaceous; the petiole is coriaceous or finely shagreened beyond to the spiracles; the following segments are highly polished.

Male.—Length 3.2 to 4.5 mm. Agrees fairly well with two or three of the other males described here, but for the following differences: The antennae are 23-jointed, black, with the scape beneath and an annulus at base of the flagellum testaceous, the first three joints of the

flagellum subequal, the first slightly longer than the second, all the joints delicately fluted; mandibles rufous; palpi and tegulæ yellowish; legs very variable in color, black and rufo-testaceous, most frequently with coxæ, base of front and middle femora and the hind femora black, the tips of hind tibiæ and their tarsi fuscous. Abdomen also variable in color, entirely black, or with one or more of the sutures rufo-testaceous, or with one or more of the segments testaceous or blotched with testaceous.

Type.—Cat. No. 5587, U. S. Nat. Museum. From St. Paul Island, August; Unga, July 21 (Fur Seal Commission).

BATHYMETIS CONFUSA sp. nov.

Female.—Length 3.8 mm. Polished black, the face below the antennæ sparsely punctate; palpi fuscous; mandibles, sutures of trochanters, tips of femora, the anterior and middle tibiæ and tarsi, except last joint, and the hind tibiæ, except at apex, rufo-testaceous.

Head subquadrate, the temples broader than the eyes. Antennæ 18-jointed, the flagellum very slightly and gradually thickened towards apex, the first and third joints of the flagellum of an equal length, a little shorter than the second, joints 7 to 9 quadrate, not longer than wide, the following to the last a little longer than wide, the last joint oblong, nearly twice as long as the penultimate. Wings hyaline, the stigma and veins brown-black, the tegulæ piceous, the epitegulæ and submedian vein pale yellowish. Abdomen oblong, polished black, one-third longer than the head and thorax united, the ovipositor not longer than the petiole, the latter finely coriaceous to its apical third.

Male.—Length 4 to 4.5 mm. Differs in having 22-jointed antennæ, the first and second flagellar joints equal, a little longer than the third; tegulæ pale yellowish; legs ferruginous with the coxæ and the hind legs, except the basal two-thirds of the tibiæ, black, the front coxæ ferruginous at apex, while the front and middle femora are more or less black or fuscous basally. Abdomen black with the third dorsal segment more or less red, or the second at apex and the third at base are red.

Type.—Cat. No. 5588, U. S. Nat. Museum. From St. Paul Island (Fur Seal Commission).

BATHYMETIS UNGÆ sp. nov.

Male.—Length 4 to 4.5 mm. Polished black, the face distinctly punctate, the fovea at base of scutellum with striæ at bottom, the met-

anotum finely wrinkled; mandibles and tegulæ dark rufo-piceous; palpi fuscous; sutures of trochanters, the anterior tibiæ entirely, the middle tibiæ, except at apex and the hind tibiæ beneath, rufo-testaceous; hind tibiæ outwardly or above, and all tarsi, black or fuscous. Head quadrate. Antennæ 21-jointed, the first joint of the flagellum the longest joint, as long as the third and fourth joints united, the second a little shorter than the first, but one-half longer than the third. Wings subfuscous, the stigma and veins brown-black, the outer vein of the areolet slender and pellucid. Abdomen elongate, polished and shining, except the petiole, which is subopaque, coriaceous, with some irregular, short aciculations.

Type.—Cat. No. 5589, U. S. Nat. Museum. From Unga, July 21 (Fur Seal Commission).

BATHYMETIS QUADRICEPS sp. nov.

Male.—Length 3.5 mm. Polished black, the face below the antennæ finely, closely punctate; palpi fuscous; a narrow annulus at base of first joint of flagellum, mandibles, sutures of trochanters, knees, anterior and middle tibiæ, and more or less of their tarsi rufo-testaceous; tegulæ rufo-piceous; epitegulæ and submedian vein yellowish-white. Antennæ 20-jointed, joints 3 and 4 equal, a little longer than the fifth, joints 13 to 19 distinctly longer than thick, the last joint conical. Scutellum with a smooth furrow across the base. Metathorax feebly wrinkled but shining, and completely areolated, the areola hexagonal, much wider than long. Wings hyaline, the stigma and veins brown, the areolet pentagonal, receiving the second recurrent nervure at its middle. Abdomen clavate, smooth and shining, except the petiole, which is feebly alutaceous, with the spiracles somewhat prominent.

Type.—Cat. No. 5590, U. S. Nat. Museum. From Popof Island, July 7; St. Paul Island, August 15 (Fur Seal Commission).

BATHYMETIS SIMULATOR sp. nov.

Male.—Length 4.5 mm. Agrees very closely with *B. quadriceps* in color and in having 20-jointed antennæ, but may be separated readily by the following differences: The palpi are pale yellowish, not fuscous; antennal joints 13 to 19 are not, or scarcely, longer than thick; the transverse furrow at base of the scutellum is finely striate at the bottom; the metanotum is more coarsely wrinkled, with the areola longer than wide; the stigma and veins are darker brown, almost black, the areolet receiving the second recurrent

nervure a little beyond the middle; while the petiole of the abdomen is stouter, finely coriaceous, except at apex, with the spiracles normal.

Type.—Cat. No. 5591, U. S. Nat. Museum. From St. Paul Island (Fur Seal Commission).

BATHYMETIS BICOLOR sp. nov.

Female.—Length 5 to 5.5 mm. Head, thorax, antennæ, coxæ, first joint of trochanters, and basal segment of abdomen, except sometimes apically, are black; rest of legs and abdomen red, sometimes the basal two or three joints of the antennæ are more or less ferruginous. The head is transverse, the temples rounded. The antennæ are 20-jointed, the flagellum being thickened towards apex, the first joint of same being the longest joint, about twice as long as thick at apex, the following joints to the 5th gradually shortening, joint 6 and those beyond being a little wider than long, the last oblong. Wings oblong, the stigma and veins brown, the epitegulæ yellowish-white, the areolet receiving the second recurrent nervure at or very near its middle.

Male.—Length 5.5 to 6 mm. Agrees well with the female in color except that the apex of the fourth abdominal segment and the following segments are black, while the antennæ are longer, filiform, 24-jointed, the third joint only a little longer than the fourth, the following joints to the last very gradually and slightly shortening, but none wider than long.

Type.—Cat. No. 5592, U. S. Nat. Museum. From Berg Bay, June 10.

Genus *Plectocryptus* Thomson.

Two species taken in Alaska belong in this genus; they may be separated as follows:

1. Ferruginous, with sutures of thorax black.

Antennæ less than 26-jointed..... 2

Antennæ 26-jointed.

Flagellum black, joints 6 to 12 yellowish-white, the second and third joints about equal in length, not much longer than thick at apex, shorter than the first*P. yakutatensis*.

2. Antennæ 24-jointed, brownish-yellow to joint 14 or 15, beyond fuscous or black; flagellar joints 2 and 3 equal, scarcely longer than thick and shorter than the first*P. popofensis*.

PLECTOCRYPTUS YAKUTATENSIS sp. nov.

(Pl. ix, fig. 6.)

Female.—Length 7 mm.; ovipositor as long as the first two joints of hind tarsi. Ferruginous, with the sutures of the thorax and the antennæ toward apex black. Antennæ 26-jointed, incrassated, the pedicel and joints 1 to 5 or 6 of flagellum fuscous, joints 14 and beyond black; the first joint of the flagellum is about twice as long as thick, the second and those beyond to the fifth shortening, those beyond to the last broadening and all wider than long. Wings hyaline, the stigma and veins brown, the costæ and basal veins blackish, the areolet irregularly pentagonal, receiving the second recurrent nervure at its apical third. Metathorax areolated but with the basal lateral and the middle lateral areas confluent, the spiracles elongate. Abdomen with the petiole and second segment distinctly punctate, the third segment feebly and indistinctly punctate, the following segments smooth and shining.

Type.—Cat. No. 5593, U. S. Nat. Museum. From Yakutat, June 21; Muir Glacier; Sitka (Fur Seal Commission).

PLECTOCRYPTUS POPOFENSIS sp. nov.

Female.—Length 5.5 mm.; ovipositor a little longer than the basal joint of hind tarsi. Ferruginous, with the sutures of the thoracic sclerites black; palpi yellowish-white; antennæ fuscous or blackish toward apex. The head is quadrate. The antennæ are 24-jointed, stout, strongly incrassated toward apex, the scape large, subglobose, the flagellum involuted, the first joint of same being about twice as long as thick, the following joints to the last, after the third, transverse, the last oblong. The thorax is minutely, sparsely punctate, the mesopleura from the discal impression posteriorly, being closely punctate; the metathorax is quadrate, impressed behind and rugulose, the areola large, quadrate, the basal lateral and the middle lateral areas confluent. Wings hyaline, the stigma and veins brown, the areolet rather large, irregularly pentagonal, receiving the second recurrent nervure beyond the middle. The abdomen is hardly longer than the head and thorax united, smooth and polished, except the petiole and the second dorsal segment which are punctate.

Type.—Cat. No. 5594, U. S. Nat. Museum. From Popof Island, July 8. One specimen.

This species in color mimics *Ichneumon popofensis* and, but for some slight structural characters, is scarcely distinguishable from it.

Genus **Microcryptus** Thomson.

TABLE OF SPECIES.

Black; all coxæ black.

Legs ferruginous; abdomen black, with the apices of dorsal segments 2, 3 and 4 ferruginous. Male.....*M. trifasciatus*.

Legs black and ferruginous; scape beneath, anterior and middle coxæ at apex and trochanters pale yellowish; abdomen black with the second dorsal segment at apex narrowly, the whole of the third and the middle of the fourth dorsal segments ferruginous...*M. alaskensis*.

MICROCRYPTUS TRIFASCIATUS sp. nov.

Male.—Length 5.4 mm. Black, coriaceous; palpi fuscous; epitregulæ yellowish-white; legs, except coxæ and first joint of trochanters and apical margins of dorsal abdominal segments 2, 3 and 4, the latter very narrowly, ferruginous; the coxæ, first joint of the trochanter and abdomen black. Wings hyaline, the stigma and veins brown, the areolet pentagonal, receiving the recurrent nervure very slightly beyond the middle, the submedian cell a little longer than the median.

Type.—Cat. No. 5595, U. S. Nat. Museum. From St. Paul Island, August 16 (Fur Seal Commission).

MICROCRYPTUS ALASKENSIS sp. nov.

Male.—Length 4.6 mm. Black; scape beneath, palpi, tegulæ, epitregulæ, apices of front and middle coxæ, their trochanters and the tibial spurs ivory or yellowish-white; rest of legs, except as noted, ferruginous, the front and middle coxæ black or fuscous, the hind legs mostly black, with the second joint of trochanters and the tibiæ basally ferruginous; mandibles and the extreme apex of dorsal abdominal segment 2, the whole of 3 and most of 4, rufous. Wings hyaline, the stigma and veins brown. Metathorax completely areolated. Abdomen, except the petiole which is aciculate and the second segment which is feebly shagreened, smooth and shining.

Type.—Cat. No. 5575, U. S. Nat. Museum. From Sitka, June 16. One specimen.

Genus **Plesiognathus** Förster.**PLESIOGNATHUS RUBROCINCTUS** sp. nov.

Male.—Length 4 mm. Polished black, the face finely punctate and clothed with a sericeous pile; mandibles and legs, except coxæ, first joint of trochanters, front and middle femora basally, hind femora at

basal two thirds, apex of hind tibiæ and their tarsi, which are black or fuscous, pale ferruginous; palpi and tegulæ yellowish-white; abdomen, except sutures 2 and 3 and most of second segment which are red, black. The head is quadrate, the temples broad. Antennæ 23-jointed, black, except a pale annulus at base of third joint, the third and fourth joints about equal in length or very nearly, about thrice as long as thick, the following joints to the last very gradually shortening, the penultimate being only a little longer than thick, the last fusiform, about as long as the two preceding united. Wings hyaline, the stigma and veins brown, the areolet pentagonal, receiving the second recurrent nervure very near its middle or only a little beyond it, the submedian cell a little longer than the median. The metathorax is finely wrinkled and completely areolated with the areola pentagonal, longer than wide. Abdomen elongate, smooth and polished, except the petiole which is finely coriaceous, with some irregular longitudinal raised lines and with two delicate dorsal carinæ that become obsolete beyond the spiracles just before attaining the apex of the segment.

Type.—Cat. No. 4042, U. S. Nat. Museum. From Pribilof Islands (Fur Seal Commission).

Genus **Hedylus** Förster.

HEDYLUS CRASSICORNIS Ashmead.

Hedylus crassicornis ASHMEAD, Fur Seals and Fur Seal Isl., Pt. IV, p. 339, ♀, 1899.

Type.—Cat. No. 4043, U. S. Nat. Museum. From Bering Island (Mr. Barrett-Hamilton).

HEDYLUS sp.

Belkofski. One badly broken female specimen, not in a condition for describing.

Genus **Bachia** Förster.

BACHIA NIGRA Ashmead.

Bachia nigra ASHMEAD, Fur Seals and Fur Seal Isl., Pt. IV, p. 340, ♀, 1899.

Type.—Cat. No. 4044, U. S. Nat. Museum. From St. Paul Island (Fur Seal Commission); Bering Island, July, 1897 (Mr. Barrett-Hamilton).

Tribe *HEMITELINI*.Genus *Spinolia* Förster.*SPINOLIA MINUTA* sp. nov.

Female.—Length 2 mm. Polished black; legs, except hind coxæ, ferruginous, the hind femora faintly dusky above. Antennæ 20-jointed, slightly thickened toward apex, the scape black, the pedicel yellow, the flagellum brown-black, the first joint being the longest joint. Wings hyaline, narrowed and somewhat abbreviated, the stigma and veins pale yellowish, the areolet entirely absent, the first abscissa of the radius oblique and interstitial with the second recurrent nervure, and having the same direction, the second abscissa of the radius being strongly curved upwards; the third discoidal cell is very narrow at base.

Type.—Cat. No. 5996, U. S. Nat. Museum. From St. Paul Island (Fur Seal Commission). One specimen.

Genus *Acrolyta* Förster.*ACROLYTA KARLUKENSIS* sp. nov.

Female.—Length 2.5 mm. Ovipositor not longer than the petiole. Polished black; basal half, or more, of the second dorsal abdominal segment and sometimes the base of the third narrowly at the middle, red; petiole longitudinally aciculated; mandibles and legs pale yellowish, the coxæ, femora and hind tibiæ fuscous or brownish. Antennæ 20-jointed, black, the third joint long, cylindrical, about six times as long as thick, with a pale annulus at base, but only a little longer than the fourth. Wings hyaline, the stigma and veins light brown.

Type.—Cat. No. 5597, U. S. Nat. Museum. From Karluk (Fur Seal Commission). One specimen.

ACROLYTA ACICULATA sp. nov.

Male.—Length 3.5 mm. Polished black, the clypeus rugosely punctate, the face above alutaceous; mandibles, sutures of trochanters, apices of the femora and the anterior and middle femora beneath, their tibiæ, except the hind pair at apex and tarsi, except middle and hind pairs, rufo-testaceous; tips of hind tibiæ and hind tarsi more or less fuscous or subfuscous. Wings hyaline, the stigma and veins reddish-brown, the areolet more or less partly open behind. Antennæ 24-jointed, the first joint of the flagellum about one third longer than the second, with a pale annulus at extreme base. Abdomen clavate,

smooth and shining, except the petiole which is almost as long as segments 2 and 3 united, and longitudinally striate or aciculate.

Type.—Cat. No. 5583, U. S. Nat. Museum. From Sitka, June 16; St. Paul Island (Fur Seal Commission).

Genus **Thestis** Förster.

THESTIS TRICINCTA sp. nov.

Female.—Length 3.5 mm.; ovipositor about half the length of the abdomen. Polished black, except the petiole and second segment of the abdomen which are opaque and coriaceous; the abdominal segments 2 and 3 at apex are yellow, while the extreme apex of the fourth segment has a testaceous tinge; clypeus, mandibles, palpi, tegulæ and the anterior and middle coxæ and trochanters are yellowish-white; rest of legs, except the front pair and the hind pair in part, ferruginous, the front legs yellowish, the hind coxæ and femora black, their tarsi fuscous; flagellum brown, yellowish beneath near base. Eyes very large, convergent below and leaving no malar space. Thorax with the parapsidal furrows distinct, converging and uniting a little beyond the middle of the mesonotum. Metathorax constricted at base, completely and strongly areolated. Wings hyaline, the stigma and veins light brown.

Type.—Cat. No. 5598, U. S. Nat. Museum. From Popof Island, July 8; Unga, July 7.

This is one of the genera placed by Förster in this group; I think it should be removed to the tribe *Plectiscini*. It seems to fall in naturally between *Symphylus* and *Eusterinx*.

Genus **Aclastus** Förster.

ACLASTUS RUFIPES sp. nov.

Female.—Length 3.2 mm.; ovipositor shorter than the petiole. Polished black: palpi fuscous; legs, except hind coxæ, ferruginous, the tibial spurs and tarsi paler, the hind coxæ black. Antennæ 21-jointed, brown-black, the pedicel yellowish, the first joint of the flagellum more than thrice longer than thick, longer than the second. Metathorax short, wrinkled and completely areolated, the arcola hexagonal, wider than long, the petiolar area very long. Abdomen broadly oval, smooth and polished, except the petiole which is longitudinally striate.

Type.—Cat. No. 5999, U. S. Nat. Museum. From St. Paul Island, August 16 (Fur Seal Commission).

Genus **Habromma** Förster.**HABROMMA NIGRUM** sp. nov.

Male.—Length 3 mm. Polished black; apices of front femora and their tibiæ and tarsi yellowish; middle tibiæ and tarsi and hind tibiæ obscure ferruginous, the tips of the hind tibiæ and their tarsi fuscous. Antennæ 20-jointed, the third joint the longest, fully thrice as long as thick, a little longer than the fourth. Eyes faintly hairy. Thorax with the parapsidal furrows distinct anteriorly, obsolete at the middle, the metathorax wrinkled, completely areolated except that the basal lateral and the middle lateral areas are confluent. Abdomen clavate, highly polished, except that the petiole is wrinkled and carinate, nearly of a uniform thickness throughout, only a little narrower before the spiracles, the dorsal carinæ parallel and extending clear to the apex.

Type.—Cat. No. 5600, U. S. Nat. Museum. From St. Paul Island (Fur Seal Commission).

Genus **Algina** Förster.**ALGINA ALASKENSIS** sp. nov.

Female.—Length 4 mm.; ovipositor half the length of the abdomen. Polished black, except the metathorax and the first and second dorsal segments of the abdomen which are finely coriaceous; sutures of trochanters, knees, tibiæ and tarsi testaceous, the hind tarsi and tibiæ toward apex fuscous. Head large, quadrate. Antennæ 21-jointed, fuscous toward apex, blackish toward base, the apices of joints 2 to 5 narrowly testaceous. Metathorax squarely truncate posteriorly, the metanotum completely areolated, the petiolar area confluent with the apical middle area. Petiole of abdomen stout, at apex nearly as wide as long. Wings hyaline, the stigma, except a spot at base, and the veins brown; spot at base of stigma, tegulæ and epitegulæ yellowish-white.

Type.—Cat. No. 5601, U. S. Nat. Museum. From Popof Island.

Genus **Ænoplex** Förster.**ÆNOPLEX RUFIPES** sp. nov.

Male.—Length 6 mm. Rather robust, black and shining, although sparsely and distinctly punctate, the face below the antennæ opaque, closely confluent punctate, the pronotal depressions lineate, the mesopleura rugulose, the metathorax very coarsely rugulose and deeply exca-

vated posteriorly, the clypeus shining with some sparse punctures; palpi yellowish-white; scape beneath, a spot on mandibles, and the front and middle trochanters yellowish; coxæ black; front and middle legs reddish-yellow, the hind legs red, their tarsi fuscous.

Antennæ 26-jointed, the third joint the longest, distinctly longer than the fourth and a little more than thrice as long as thick. Wings hyaline, the stigma and veins dark brown. Abdomen black, with the apex of the second dorsal segment, the third segment entirely and a tinge at base of fourth, red; the petiole is stout, shagreened and carinate, the lateral and dorsal carinæ extending to apex; the apex with some longitudinal striæ between the dorsal carinæ; the second segment is coriaceous except at the apical third or fourth, the apical third or fourth of the second segment and the following segments smooth and polished.

Type.—Cat. No. 5602, U. S. Nat. Museum. From Kodiak, July 20. One specimen.

Genus **Philonygus** Förster.

PHILONYGUS ALASKENSIS sp. nov.

Male.—Length 3.6 mm. Elongate, shining black; face below the antennæ finely punctate, *above* and the cheeks and temples polished, impunctate; palpi, except the two apical joints, tegulæ and sutures of trochanters, yellowish-white; a spot on mandibles, the knees and the front and middle femora *beneath*, testaceous.

Antennæ 22-jointed, as long as the body, the third and fourth joints the longest, and of an equal length, although only a little longer than the fifth. Wings hyaline, the stigma and veins brown-black. The parapsidal furrows are indicated anteriorly by punctate lines. The metathorax is finely wrinkled but shining and completely areolated. Abdomen elongate, clavate, the petiole and the second segment opaque, coriaceous, the third segment feebly coriaceous but shining, the following smooth or nearly so and shining.

Type.—Cat. No. 5603, U. S. Nat. Museum. From Popof Island, July 11.

PHILONYGUS GLACIALIS sp. nov.

Male.—Length 6.5 mm. Polished black; palpi fuscous; mandibles and tegulæ black; apical half or more of front and middle femora, and their tibiæ, ferruginous. Antennæ 23-jointed, black, shorter than the body. Wings hyaline, the stigma and veins dark-brown. The

parapsidal furrows are distinct to beyond the middle of the mesonotum, while the metathorax is shining and completely areolated.

Type.—Cat. No. 5745, U. S. Nat. Museum. From Lowe Inlet, June 3.

Genus **Ilapinastes** Förster.

ILAPINASTES INCERTUS sp. nov.

Male.—Length 3.5 mm. Polished black, the face closely punctate, palpi yellowish with two or three of the joints dusky medially; tegulae, sutures of the trochanters, front and middle knees and their tibiae *beneath* and the tibial spurs, yellowish; rest of legs black or fuscous. Wings hyaline, the stigma and veins brown, the stigma with a whitish spot at base. Abdomen black, with the third segment at its extreme apex and a narrow band at base, testaceous; the petiole is punctate, the second segment coriaceous, the following smooth and impunctate, except that the third segment exhibits, under a strong lens, a feeble punctuation towards its base.

Type.—Cat. No. 5604, U. S. Nat. Museum. From Popof Island, July 11.

Genus **Isochresta** Förster.

ISOCHRESTA UNICINCTA sp. nov.

Male.—Length 3.6 mm. Polished black, the face faintly punctate just beneath the insertion of the antennae and sericeous; sutures of trochanters, apices of femora, all tibiae and the front and middle tarsi, yellowish; the apex of the hind tibiae is subfuscous, their tarsi fuscous. The abdomen except the third segment is black, the third segment having a testaceous band across the base; the petiole is coriaceous and bicarinate to beyond the spiracles. Antennae 20-jointed, with the third joint a little longer than the fourth. Metathorax finely rugulose and completely areolated.

Type.—Cat. No. 5605, U. S. Nat. Museum. From St. Paul Island, August 16 (Fur Seal Commission).

Tribe **PEZOMACHINI**.

Genus **Thaumatotypus** Förster.

THAUMATOTYPUS ALASKENSIS (Ashmead).

Cremnoides alaskensis ASHMEAD, Trans. Am. Ent. Soc., XXIII, p. 211, ♀, 1896.

Type.—Cat. No. 3717, U. S. Nat. Museum. From Wrangell (Professor H. F. Wickham).

Genus **Theroscopus** Förster.

Three of the Alaskan pezomachines fall in this genus and may be tabulated as follows :

TABLE OF SPECIES.

- | | |
|---|-----------------------|
| 1. Winged | 3. |
| Wingless | 2. |
| 2. Black; legs, including coxæ, red. Female..... | <i>T. rufipes.</i> |
| Ferruginous, the head alone black. Female..... | <i>T. kukakensis.</i> |
| 3. Body, except a reddish tinge at apex of second abdominal segment, black; legs honey-yellow, with all coxæ, first joint of trochanters and hind femora black, the front and middle femora basally and the apices of hind tibiæ and joints of their tarsi, fuscous.* Male. | |
| | <i>T. popofensis.</i> |

THEROSCPUS RUFIPES sp. nov.

Female.—Length 3.5 mm. Black, subopaque, coriaceous; pedicel and annulus at base of first joint of flagellum flavo-testaceous; mandibles rufo-piceous; legs, including coxæ, rufo-testaceous.

Head large, subquadrate, much wider than the thorax, the temples full, as wide as the eyes. Thorax constricted at the middle, the scutellum small but distinct. Wings wanting or at most represented by a white scale. Metathorax obliquely truncate posteriorly, without a distinct transverse carina, the latter being represented by a trace only at the upper hind angles of the truncature. The abdomen and antennæ are broken in the single specimen and cannot be described in detail.

Male.—Length 2.2 mm. Apterous and agrees well with the female, except in its much smaller size and in having the legs paler, more decidedly yellowish than rufous. The antennæ are 19-jointed, with the flagellum brown. The abdomen is about one third longer than the head and thorax united, black and shining, except the claspers which are large and broad, and dark rufous.

Type.—Cat. No. 5606, U. S. Nat. Museum. From St. Paul Island, August 13 (Fur Seal Commission). Two specimens.

THEROSCPUS KUKAKENSIS sp. nov.

Female.—Length 3 mm.; ovipositor about the length of the petiole. Pale ferruginous, with the head and the sheaths of the ovipositor black; antennæ and legs brownish-yellow; head and thorax coriaceous, opaque, the abdomen smoother and more shining although feebly coriaceous.

The head is large, transverse, nearly twice the width of the thorax, with the temples rounded, not quite the width of the eyes. The thorax is constricted near the middle, the scutellum being only feebly differentiated by a small elevation which is not distinctly separated from the mesonotum. Metathorax rounded off posteriorly and without a trace of the transverse apical carina.

Type.—Cat. No. 5607, U. S. Nat. Museum. From Kukak Bay, July 4. One specimen.

THEROSCOPUS POPOFENSIS sp. nov.

Male.—Length 4.4 mm. Black, subopaque, coriaceous, the abdomen shining with a piceous or rufous tinge at apex of the second segment; palpi fuscous; first joint of the flagellum with a yellowish annulus at extreme base; legs honey-yellow, with the coxæ, first joint of trochanters and the hind femora black; tips of hind tibiæ, their tarsi, more or less, except at apices of joints and beneath, and the middle and front femora *above* basally, fuscous. Wings hyaline, the stigma dark brown but yellowish at base and between the parastigma and stigma, the internal veins brownish, the tegulæ and the longitudinal veins at the base of the wings pale yellowish. The antennæ are 22- or 23-jointed, not quite the length of the body, the first joint of the flagellum the longest although only a little longer than the second, the joints beyond imperceptibly shortening. The metathorax has the pleural and transverse apical carinæ distinct and there is also a more or less completely defined hexagonal area.

Type.—Cat. No. 5608, U. S. Nat. Museum. From Popof Island. One specimen.

Genus *Pezomachus* Gravenhorst.

PEZOMACHUS NIGRELLUS sp. nov.

Male and Female.—Length 1.5 to 2 mm. Entirely black and shining although the surface is feebly alutaceously sculptured; legs black or dark fuscous, with usually the sutures of the trochanters, knees and the front and middle tibiæ and tarsi and sometimes the hind tibiæ basally, rufo-testaceous, rarely with all the tibiæ and tarsi rufo-testaceous.

The antennæ are as long as or a little longer than the body, in the female 18-jointed, in the male 20-jointed, the first joint of the flagellum being slightly the longest and always with a yellowish annulus at the extreme base. Both sexes are apterous. The metathorax is some-

what squarely and abruptly truncate posteriorly, the truncature being encircled by a delicate carina. The abdomen in the female is oblong-oval, about thrice the width of the thorax; above it is highly convex, beneath flat, the ovipositor being short, hardly the length of the petiole, dorsal segments 2 to 4 subequal, the second not or scarcely shorter than the petiole. In the male the abdomen is much narrower, scarcely twice as wide as the thorax, with large broad, dark rufous claspers; otherwise hardly distinguishable from the female.

Type.—Cat. No. 4015, U. S. Nat. Museum. From St. Paul Island, Pribilof Islands (Fur Seal Commission). 81 specimens representing both sexes.

PEZOMACHUS OBESUS sp. nov.

Female.—Length 3.5 mm. Black and shining; mandibles and legs, including coxæ, uniformly pale ferruginous or brownish-yellow; flagellum light brown, the pedicel and an annulus at base of first joint, pale yellowish. The head is large, quadrate, shining, the temples full, as wide as the eyes; antennæ 19-jointed, about two thirds the length of the body; the thorax constricted a little beyond the middle, its anterior lobe being distinctly the longer, the scutellum entirely wanting, the metathorax obliquely truncate posteriorly, the truncature surrounded by a delicate carina, while its disk above has a small central fovea or impression. The abdomen is large, swollen, oblong, oval; across its widest part it is fully thrice the width of the thorax, dorsal segments 2 and 3 subequal, 4 and 5 shorter; ovipositor short, not longer than the petiole.

Type.—Cat. No. 5609, U. S. Nat. Museum. From St. Paul Island (Fur Seal Commission).

PEZOMACHUS ALASKENSIS Ashmead.

Pezomachus alaskensis ASHMEAD, Proc. U. S. Nat. Mus., XII, p. 421, ♀, 1890.

Type.—Cat. No. 2052, U. S. Nat. Museum. From Nushagak River (Chas. W. McKay).

Tribe *CRYPTINI*.

Genus *Cryptoideus* Ashmead.

CRYPTOIDEUS SITKENSIS sp. nov.

Female.—Length 10 mm.; ovipositor two-thirds the length of the abdomen. Ferruginous with the head and the sutures of the thorax black; antennæ blackish toward apex, the first three joints of the

flagellum elongate, the first the longest, about seven times as long as thick. Head closely, rugulose punctate, the clypeus with a median tooth anteriorly. Thorax smooth and shining but sparsely punctate, the parapsidal furrows distinct anteriorly for more than half the length of the mesonotum; the metathorax has two transverse carinæ and a more or less complete areola, the lateral carinæ of same being however very delicate; spiracles oval but not large. Wings hyaline, with a small but distinct fuscous cloud beneath the stigma; the disco-cubital vein is broken by a long stump of a vein at its middle; areolet pentagonal, narrowed above. The abdomen is longer than the head and thorax united, the petiole being smooth, elbowed at its apical third and with two dorsal carinæ that extend a little beyond the spiracles; dorsal segments finely, closely punctulate or shagreened, the sculpture of segment 5 and beyond being finer and less distinct.

Type.—Cat. No. 5610, U. S. Nat. Museum. From Sitka, June 16. One specimen.

Differs from the type species of *Cryptoideus* in having the apical transverse carina complete, but agrees otherwise in all essential generic characters.

Subfamily *PIMPLINÆ*.

Tribe *LISSONOTINI*.

Genus *Himertosoma* Schmiedeknecht.¹

HIMERTOSOMA SCHMIEDEKNECHTI sp. nov.

Male.—Length 4.5 mm. Black; face below the insertion of the antennæ, except a short median line at base, cheeks, mandibles, palpi, tegulæ, and the front and middle coxæ and trochanters and the second joint of the hind trochanters, yellow or yellowish-white; rest of front and middle legs fulvous, the hind legs black. Wings hyaline, the stigma and veins brownish-yellow, the venation similar to that in the genus *Lampronota* except that the submedian cell is fully as long as the median, or a little longer, the disco-cubital vein being curved, while the transverse median nervure in the hind wings is broken far below the middle. Abdomen polished black, except the petiole which is finely wrinkled and bicarinate, the ventral fold more or less yellowish or whitish.

¹This genus and *Ecthrodoca* Schmiedeknecht, do not appear in my classification of the Ichneumon Flies (Proc. U. S. Nat. Mus., xxiii, 1890); they were characterized after it was submitted for publication, *vide* Zool. Jahrb. Jena, Bd. xiii, 1890, pp. 303, 306.

Type.—Cat. No. 5611, U. S. Nat. Museum. From Yakutat, June 24. One male specimen.

Named in honor of Dr. O. Schmiedeknecht, the distinguished hymenopterologist of Blankenburg, Germany, who has so ably monographed the *Pimplinæ* of the European fauna.

Genus **Lampronota** Haliday.

LAMPRONOTA LUGUBRIS Cresson.

Lampronotus? lugubris CRESSON, Proc. Acad. Nat. Sci. Phila., p. 379, ♀, 1878.—CRESSON, Syn. Hym. North America, p. 219, 1887.
Cylloceria fuscolina DAVIS, Trans. Am. Ent. Soc., XXIV, p. 371, ♂, 1897.

Type in Collection of the American Entomological Society. From Popof Island, July 10; Unalaska, August 24. Three male specimens.

Originally described by Cresson from a single female collected at Lake Quesnel, British Columbia. The male was described as *Cylloceria fuscolina* by Davis in 1897. It resembles the male of *Lampronota occidentalis* Cresson, but is at once separated by having all the coxæ black, the first joint of the trochanters being dusky above, while the hind tibiæ and tarsi are entirely black.

Genus **Phytodietus** Gravenhorst.

Two species belonging to this genus have been found in Alaska and may be tabulated as follows:

TABLE OF SPECIES.

Black; extreme apices of dorsal segments 2 to 6 more or less white.

Clypeus yellow, the face above black; all coxæ, except the apices of front and middle pairs which are whitish, black.....*P. clypearius*.

Clypeus and the face lemon-yellow; front and middle coxæ and trochanters white, the hind legs, except the second joint of the trochanters, black.....*P. flavifrons*.

PHYTODIETUS CLYPEARIUS sp. nov.

Male and Female.—Length 5.5 mm. Polished black, the face coriaceous; clypeus, mandibles, palpi, tegulæ, the extreme tips of dorsal abdominal segments 3 to 6, or the sutures, the tips of front tibiæ and more or less of the apices of the front and middle coxæ, yellow or yellowish-white; rest of legs, except coxæ, basal joint of hind trochanters, extreme apex of their femora and their tibiæ and tarsi which are black, fulvous, the middle tibiæ *above* and their tarsi usually

fuscous. Wings hyaline, the stigma and veins light brown, the areolet rather long, oblique, while the submedian cell is distinctly longer than the median. Abdomen polished black, subcompressed at apex, the petiole with two abbreviated carinæ at basal third, the ovipositor about the length of the abdomen.

Type.—Cat. No. 5612, U. S. Nat. Museum. From Yakutat, June 21.

PHYTODIETUS FLAVIFRONS sp. nov.

Male.—Length 6 mm. Polished black; a dot on vertex above each eye, the face below the antennæ, the cheeks and the mandibles, lemon-yellow; palpi, scape and pedicel *beneath*, tegulæ, a spot beneath, a spot on prosternum anteriorly, front and middle coxæ and trochanters, tibial spurs and second joint of hind trochanters, yellowish-white; rest of legs, except the hind pair, fulvous, hind legs black, their femora mostly red, with sometimes the extreme base and apex subfuscous; otherwise in venation and structural characters as in *P. clypearius*. One specimen has the hind femora wholly rufous.

Type.—Cat. No. 5613, U. S. Nat. Museum. From Yakutat, June 21; Orca, June 24.

Genus *Trevoria* Ashmead.

TREVORIA YAKUTATENSIS sp. nov.

(Pl. x, fig. 3.)

Male.—Length 8 mm. Black; clypeus ferruginous, distinctly separated from the face; the legs, except the coxæ and trochanters, the hind tibiæ and tarsi and the middle tarsi which are black, are red. Wings hyaline, the stigma and veins brown, the areolet pentagonal, closed by a hyaline vein, receiving the second recurrent nervure beyond its middle, the submedian cell distinctly longer than the middle, while the transverse median nervure in the hind wings is broken far below the middle, very near its basal fourth. The head is transverse, opaque, coriaceous or finely, closely punctate. Metathorax finely rugulose, with two delicate, median carinæ at base above; the pleural carinæ are distinct. Abdomen elongate, sessile, twice longer than the thorax, depressed, finely, evenly shagreened, the sculpture smoother or less evident, on segment five and beyond, usually with a glabrous space at apex of segments. Claws simple, not pectinate.

Type.—Cat. No. 5614, U. S. Nat. Museum. From Yakutat, June 21. One specimen.

Genus *Lissonota* Gravenhorst.

LISSONOTA ALASKENSIS sp. nov.

Female.—Length 7.5 mm. Black, coriaceous; apex of second dorsal abdominal segment, base of third, and the legs, except coxæ, basal joint of trochanters and the hind tarsi, red. Wings hyaline, the stigma and veins brown, the areolet oblique, petiolate, the disco-cubital nervure curved but showing a faint trace of a stump of a vein at its basal third (so small as to be easily overlooked), the submedian cell a little longer than the median, while the transverse median nervure in the hind wings is not quite straight, very obtusely angularly broken a little below the middle.

Type.—Cat. No. 5614, U. S. Nat. Museum. From St. Paul Island (Fur Seal Commission). One specimen.

LISSONOTA RUFICOXIS Schmiedeknecht.

Lissonota sulferifera GRAVENHORST, var. *ruficoxis* SCHMIEDEKNECHT, Zool. Jahrb. Jena, XIII, p. 360, 1900.

Kukak Bay, July 4. One female specimen.

The single specimen taken, so far as the description goes, agrees perfectly, in size and color, with the brief description of this European species as given by Dr. Schmiedeknecht, who defined it as a variety of the European species *Lissonotus sulferifera* Gravenhorst. I have no European specimens of this variety for comparison, but if our specimen is identical with Schmiedeknecht's then I cannot agree with him in considering it a variety of *L. sulferifera*, since in comparison with European specimens of this species, besides a difference in the color of the legs, I find a difference in venation, and it should be considered a distinct species. The venation of the front wings is exactly as in *L. rimator* Thomson, and it is much closer related to that species than to *L. sulferifera*.

* Genus *Pimplopterus* Ashmead.

PIMPLOPTERUS YAKUTATENSIS sp. nov.

Female.—Length 6 mm. Black opaque, coriaceous, clypeus yellowish and distinctly separated from the face; legs, except the coxæ, basal joint of trochanters and hind tibiae and tarsi red. Wings hyaline, the stigma and veins brown, the areolet oblique but sessile, receiving the second recurrent nervure beyond the middle, the submedian cell

distinctly longer than the median, the disco-cubital nervure strongly curved, the transverse median nervure in the hind wings broken far below the middle, at or near the basal fourth. The metathorax has the apical transverse carina alone distinct, the pleural carinae being absent, while the spiracles are small, short oval. The abdomen is sessile, distinctly finely shagreened, the first segment longer than the second, without dorsal carinae but with a median depression at the extreme base; the second and third segments are about equal in length but the third is slightly the wider; the fourth and fifth segments are very unequal in length, much shorter than the third, the fifth being only about one third the length of the second; the sixth segment is scarcely visible; ovipositor longer than the abdomen.

Type.—Cat. No. 5616, U. S. Nat. Museum. From Yakutat, June 21. One specimen.

PIMPLOPTERUS ALASKENSIS sp. nov.

(Pl. x, fig. 6.)

Female.—Length 8 mm. Head and thorax, except the clypeus and the mesonotum, and the abdomen, except the apex of the first segment and segments 2 to 4, black; clypeus, mesonotum, apex of first abdominal segment and dorsal segments 2 to 4, rufous; legs, except the hind trochanters, hind tibiae and hind tarsi, ferruginous. Wings subhyaline with the venation as in *P. yakutatensis*. Ovipositor longer than the whole body.

Type.—Cat. No. 5717, U. S. Nat. Museum. From Kodiak, July 20. One specimen.

Genus **Harrimaniella** Ashmead.

Harrimaniella ASHMEAD, Proc. U. S. Nat. Mus., XXIII, p. 52, 1900.

Named in honor of Mr. Edward Henry Harriman, of New York, originator of the Harriman Expedition, and based on the species characterized below.

HARRIMANIELLA KUKAKENSIS sp. nov.

(Pl. x, fig. 2.)

Male.—Length 6.5 mm. Black, closely punctate; a dot at summit of each eye, the face except a median black stripe, the clypeus, cheeks, mandibles, except teeth, palpi, a broad line along the lateral margins of the mesonotum, tegulae, a dot in front and beneath them, a dot above the insertion of the hind coxae, the front and middle coxae and trochanters yellow or yellowish-white; rest of legs, except the hind

tibiæ and tarsi, pale reddish, the hind tibiæ and tarsi black. Wings hyaline, the stigma and veins brown, the areolet oblique, petiolate, receiving the second recurrent nervure beyond the middle, the latter being slightly angulated above the middle, the submedian cell distinctly longer than the median, the disco-cubital nervure strongly curved, while the transverse median nervure in the hind wings is broken below the middle at about its basal third. The metathorax has two delicate parallel carinæ down its center which unite with the transverse apical carina, the pleural carinæ absent, the spiracles small, rounded. The abdomen is normal, finely shagreened, except the apices of the segments which are smooth and glabrous.

Type.—Cat. No. 5618, U. S. Nat. Museum. From Kukak Bay, July 4. One specimen.

Genus **Echthrodoxa** Schmiedeknecht.

ECHTHRODOXA GELIDA (Cresson).

Lampronota gelida CRESSON, Proc. Acad. Nat. Sci. Phila., p. 377, ♂, 1878.

—CRESSON, Syn. Hym. North America, p. 219, 1887.

Type in collection of the American Entomological Society. From Juneau, July 25; Seldovia, July 25. Occurs also in British Columbia.

ECHTHRODOXA CLYPEARIA sp. nov.

Male.—Length 11 mm. Black, with the head and thorax closely punctate, the first segment of abdomen sparsely punctate, except at apex, the second and following segments smooth, but under a strong lens show a fine coriaceous sculpture; clypeus, apex of second dorsal abdominal segment, the third wholly, except two spots, and sometimes a faint spot on the fourth laterally, yellowish; legs except coxæ and first joint of trochanters pale reddish. Wings hyaline, the stigma and veins brownish-yellow, the venation otherwise as in *E. gelida* Cresson.

Type.—Cat. No. 5619, U. S. Nat. Museum. From Seldovia, July 21. One specimen.

Tribe *PIMPLINI*.

Genus **Rhyssa** Holmgren.

RHYSSA ALASKENSIS sp. nov.

Female.—Length 17 mm. Black; front orbits to summit of eyes, a line on upper margin of pronotum, interrupted anteriorly at the middle, a line on the lower margin, or sides, just above front coxæ, a

spot beneath the tegulæ, an angulate line at apical angles of first dorsal abdominal segment, a transverse oblong spot at the apex of segments 2 to 5 and a line below it at the lateral apical angles, and a line at the apex of the sixth segment, white; the legs, except the coxæ, basal joint of hind trochanters and the hind tibiæ and tarsi, which are black, are red; sculpture and venation as in *Rhyssa persuasoria* Linné.

Type.—Cat. No. 5620, U. S. Nat. Museum. From Fox Point, July 28. One specimen.

Comes nearest apparently to *R. albomaculata* Cresson but is quite distinct in color of legs and in shape of the areolet in front wings.

Genus *Pimpla* Fabricius.

PIMPLA YAKUTATENSIS sp. nov.

Male.—Length 6 to 7 mm. Polished black, the face below the antennæ distinctly, closely punctate, the metathorax sparsely punctate without carinæ, the abdomen closely punctate, with dorsal segments 2 to 5 slightly tumid and smoother at their apices. The legs, except the hind tibiæ and tarsi, are red, the hind tibiæ and tarsi black or fuscous, the tibiæ with a yellowish or whitish annulus before the middle, sometimes incomplete or interrupted with black beneath, represented by a whitish spot on outer face. Wings hyaline, the stigma and veins brown, the areolet sessile, subrhomboidal, while the disco-cubital vein has usually only a faint trace of a stump of a vein beyond its middle, rarely distinct.

Type.—Cat. No. 5621, U. S. Nat. Museum. From Yakutat, June 21. Five specimens.

Genus *Epiurus* Förster.

In this genus fall two species, which may be separated as follows: Black.

- Hind coxæ and legs red.....2.
All coxæ and the first joint of trochanters black.

Legs, except as noted, red, the hind tibiæ and tarsi black or fuscous, the hind tibiæ with an annulus at base and a spot on outer face near the middle pale yellowish or whitish, the basal joint of their tarsi sometimes white at base.....*E. atrocoxalis*.

2. Legs, except the front and middle coxæ and the first joint of trochanters which are black, red; labial palpi fuscous; maxillary palpi pale yellowish.....*E. bicoloripes*.

EPIURUS ATROCOXALIS sp. nov.

Female.—Length 5.5 mm. Polished black, except the abdomen which is distinctly punctate, the first segment bicarinate for two thirds its length; legs except the coxæ, first joint of trochanters and the hind tibiæ and tarsi, red, the coxæ, hind tibiæ and tarsi black, the hind tibiæ with an annulus at base and a spot outwardly near the middle, or an annulus, white or yellowish-white, the basal joint of hind tarsi at base, and sometimes the second joint at base, whitish, wings hyaline, the areolet long, oblique, receiving the second recurrent nervure at its apex.

Male.—Length 5 mm. Agrees well with the female except that the hind tibiæ and tarsi are entirely black.

Type.—Cat. No. 5622, U. S. Nat. Museum. From Muir Inlet, June 12; Seldovia, July 21.

EPIURUS BICOLORIPES sp. nov.

Female.—Length 6.5 mm. Resembles *E. atrocoxalis* in sculpture but is readily separated by its larger size and by the color of the legs; the legs, except the front and middle coxæ and first joint of the trochanters are red, the front and middle coxæ and first joint of trochanters are black; labial palpi fuscous; maxillary palpi, tegulæ and epitegulæ yellowish-white, while the metanotum has two parallel dorsal carinæ.

Type.—Cat. No. 5623, U. S. Nat. Museum. From Berg Bay, July 10. One specimen.

Genus *Glypta* Gravenhorst.

GLYPTA KUKAKENSIS sp. nov.

Female.—Length 6.5 mm. Black with the head and thorax distinctly closely punctate, the dorsal segments 2 to 4 with oblique furrows; legs, including coxæ, red, the apices of hind tibiæ and their tarsi fuscous. Wings subhyaline, the stigma and veins brownish-yellow, the areolet open behind, the transverse cubitus about as long as the first abscissa of the radius. Metathorax above bicarinate, the carinæ divergent posteriorly.

Type.—Cat. No. 5624, U. S. Nat. Museum. From Kukak Bay, July 4. One specimen.

GLYPTA POPOFENSIS sp. nov.

Female.—Length 9 mm. Agrees very closely with *G. kukakensis* in sculpture and wing characteristics but differs in having the hind

tibiæ and tarsi fuscous, the tibiæ having a long whitish stripe posteriorly, or on the outer face, the first and second joints of hind tarsi having a whitish annulus at base, while the clypeus and the mandibles are red.

Male.—Length 6 mm. Differs from female in having the clypeus black, the hind tibiæ red, except an annulus toward base and the apices which are black, while their extreme base is whitish.

Type.—Cat. No. 5625, U. S. Nat. Museum. From Popof Island, July 12. Two specimens.

Tribe *XORIDINI*.

Genus *Holcostizus* Förster.

HOLCOSTIZUS YUKONENSIS (Ashmead).

Pimpla yukonensis ASHMEAD, Proc. U. S. Nat. Mus., XII, p. 445, ♀, 1890.

Type.—Cat. No. 2106, U. S. Nat. Museum. From Fort Yukon (L. M. Turner).

Genus *Odontomerus* Gravenhorst.

ODONTOMERUS MELLIPES (Say).

Anomalon mellipes SAY, Maclurian Lyc. Arts & Sci., I, p. 74, ♀, 1828.—

LECONTE, Ed. Say, II, p. 378, 1859.

Odontomerus mellipes WALSH, Trans. St. Louis Acad. Sci., III, p. 164, ♀♂, 1873.—PROVANCHER, Fn. du Can. Hym., p. 490, 1883.—CRESSON, Syn. Hym. North America, p. 220, 1887.—ASHMEAD, in Smith's Ins. New Jersey, p. 575. 1900.

From Sitka, August.

Widely distributed throughout North America from Florida to Canada, and from the Atlantic to the Pacific.

Genus *Cubocephalus* Ratzeburg.

Three species fall in this genus, as defined by the writer in his Classification of the Ichneumon Flies, although there is some doubt as to its being the *Cubocephalus* of Ratzeburg, since it was identified from description alone and I have not been able to confirm it by a study of typical European specimens.

TABLE OF SPECIES.

Black species.

All coxæ rufous

All coxæ black.

Legs red, with the hind tibiæ and all tarsi black or fuscous, sometimes with the extreme apices of the joints of the first and middle tarsi testaceous; mandibles, except teeth, red.....*C. atroxalis*.

2. Legs rufous with the hind tibiæ and tarsi black, the middle tarsi fuscous, the apices of joints 1 to 4 yellowish; clypeus with the anterior margin testaceous; mandibles rufo-piceous with a large yellowish-white spot at base.....*C. alaskensis*.
 Legs rufous, with the hind femora toward apex and their tibiæ and tarsi black, the apex of the middle tibiæ and tarsi subfuscous; clypeus wholly black; mandibles yellowish-white with black teeth.
C. nigricornis
 (= *Echthrus nigricornis* Provancher, part).

CUBOCEPHALUS ATROCOXALIS sp. nov.

Female.—Length 8 to 10 mm.; ovipositor about two thirds the length of the abdomen. Black, very finely, closely punctate; mandibles, except teeth, and legs, except coxæ, hind tibiæ and tarsi red; palpi yellowish; tegulæ, epitegulæ and apices of ventral segments 1 to 3 yellowish-white. Wings subhyaline, the stigma and veins black, the areolet oblique, rhomboidal. Claws pectinate. Metathoracic areola partly formed but confluent with the petiolar area.

Type.—Cat. No. 5626, U. S. Nat. Museum. From Alaska (U. S. Coast and Geodetic Survey). Exact locality unknown. Easton, Washington (Albert Kæbele).

CUBOCEPHALUS ALASKENSIS sp. nov.

Female.—Length 7–8 mm. Agrees well with *C. atrocoxalis*, except that all the coxæ are red, the hind tibiæ and tarsi black, the middle tarsi more or less fuscous with the tips of the joints yellowish, the anterior margin of the clypeus and scape at apex narrowly, are testaceous; wings clear hyaline; while the four apical segments of the abdomen are almost smooth, shining.

Type.—Cat. No. 5627, U. S. Nat. Museum. Alaska.

CUBOCEPHALUS NIGRICORNIS sp. nov.

Echthrus nigricornis PROVANCHER (*partim*), Faun. ent. du Can., 11, p. 803, ♀ (*nec*. ♂, p. 486), 1883.—CRESSON, Syn. Hym. North America, p. 221 (part), 1887.

Cryptus or *Phygadenon* species DAVIS, Proc. Acad. Nat. Sci. Phila., p. 190 (part), 1894.

Female.—Length 7.5 to 8 mm. Agrees in stature and color fairly well with *C. alaskensis*, except that the clypeus is entirely black, not testaceous anteriorly, the apex of the hind femora and their tibiæ and tarsi are wholly black, the abdomen with a very fine alutaceous or coriaceous sculpture, while the areolet in the front wings is usually very irregularly pentagonal, although sometimes subrhomboidal or oblique as in the other species.

Type.—Cat. No. 5752, U. S. Nat. Museum. From Alaska (U. S. Coast and Geodetic Survey); Sherbrook, Canada (Abbe Bégin).

In *Le Naturaliste Canadien*, vii, 1875, p. 264, Abbe Provancher described a male insect under the name *Mesostenus nigricornis* which he afterwards in his *Fauna entomologique du Canada*, 1883, correlated incorrectly with a female under the same name.

The name *nigricornis* Provancher must be retained for the male which belongs to quite a different genus in a different tribe and subfamily; and the female, incorrectly correlated with it, I have here named *Cabocephalus nigricornis*.

Genus **Xylonomus** Gravenhorst.

XYLONOMUS FRIGIDUS Cresson.

Xylonomus frigidus CRESSON, Trans. Am. Ent. Soc., III, p. 168, 1870.—PROVANCHER, Fn. du Can. Hym., p. 489, 1883.—CRESSON, Syn. Hym. North America, p. 220, 1887.

Type in collection of the American Entomological Society. From Fort Yukon (L. M. Turner). Originally described from Hudson Bay Territory, but found throughout Canada and southward into the New England States and New York.

Subfamily *TRYPHONINÆ*.

Tribe *MESOLEPTINI*.

Genus **Spanoctecnus** Förster.

SPANOCTECNUS FLAVOPICTUS sp. nov.

Male.—Length 4.1 mm. Polished black; anterior orbits, face below antennæ, cheeks, mandibles, front and middle coxæ and trochanters, a line on each side of the mesosternum, and apical margins of dorsal abdominal segments 2 to 4, lemon-yellow; hind coxæ black; rest of legs, except the first joint of trochanters *above*, more or less, and the middle and hind femora *above*, more or less; hind tibiæ at apex and their tarsi, which are fuscous, red. Wings hyaline, the stigma and veins light brown, the tegulæ yellowish-white.

Type.—Cat. No. 5628, U. S. Nat. Museum. From Unalaska, September 17 (Fur Seal Commission). One specimen.

Genus **Eclytus** Holmgren.

ECLYTUS YAKUTATENSIS sp. nov.

Male.—Length 5 mm. Polished black; orbits opposite antennæ, the face below, including the cheeks and mandibles, except a tridentate (m) black mark just beneath the insertion of antennæ, and the front

and middle coxæ and trochanters, except a black streak above, yellow; hind legs black or dark fuscous; rest of legs rufo-testaceous.

Antennæ 28-jointed, brown black. Wings hyaline, the stigma and veins light brown, the outer edge of the stigma and the costal vein brown black. Abdomen elongate, smooth and shining, except the petiole which is finely, irregularly rugulose and bicarinate basally.

Type.—Cat. No. 5629, U. S. Nat. Museum. From Yakutat, June 21. Two specimens.

DALLATORREA gen. nov.

This new genus, remarkable in several particulars and especially in its mandibular and metathoracic characters, is named in honor of the learned author of the great work, *Catalogus Hymenopterorum*, Dr. C. W. von Dalla Torre, professor in the Imperial Leopold-Franzeus University, Innsbruck, Austria, who has not only been a prolific and valuable contributor toward a knowledge of European Hymenoptera, but who, in compiling this great catalogue—a labor of 30 years—has endeared himself to all working hymenopterologists and reared for himself a lasting monument.

The true position of this singular genus cannot be definitely settled until the female is discovered. From present knowledge it might just as well be placed in the tribe *Plectiscini*, with which it agrees in some of its cephalic characters, especially with such genera as *Catastenus* and *Symplecis*, as well as with the *Mesoleptini*.

For the present, however, judging alone from the characters of the male, I consider it to belong to this group, and in my generic table of the *Mesoleptini*, *Classification of the Ichneumon Flies*, p. 65, it will fall in next to the genus *Gausocentrus* Förster.

The two may be separated by the following characters:

Metathorax bispined, the mesonotal furrows strongly impressed anteriorly; scutellum black; eyes converging anteriorly; mandibles conically acute, although bidentate, the teeth very unequal, the inner tooth being very minute, almost invisible and less than half the length of the apical or outer tooth.....*Dallatorrea*.

Metathorax normal, unarmed, the mesonotal furrows not strongly impressed: scutellum yellow; eyes parallel, not converging anteriorly; mandibles bidentate, the teeth equal.....*Gausocentrus* Förster.

DALLATORREA ARMATA sp. nov.

(Pl. x, fig. 5.)

Male.—Length 7 mm. Polished black; mandibles rufo-testaceous; palpi and tegulæ pale yellowish; front legs brownish-yellow, the

middle and hind legs, except the hind tarsi which are black or fuscous, reddish-brown; abdomen black with the apices of dorsal segments 2 and 3 narrowly yellowish; antennæ except the ring-joint, entirely black. Wings hyaline, the stigma and veins brown black, the discocubital vein broken by a slight stump of a vein before its middle, the areolet oblique, petiolate, receiving the second recurrent nervure near its apex. Scutellum longitudinally striate. Metathorax bidentate or bispined, the upper hind angles being produced into a long tooth or spine, the areola elongate, about thrice as long as wide. Abdomen twice longer than the head and thorax united, the petiole very long and slender, as long as segments 2 and 3 united, very slightly curved at apex as seen from the side, coriaceous, the spiracles situated at the basal third.

Type.—Cat. No. 5630, U. S. Nat. Museum. From Sitka, June 16. One specimen.

Genus **Gausocentrus** Förster.

Mr. Davis¹ has incorrectly placed in this genus *Mesoleptus strigosus* Cresson. The type of this species, No. 1604 (Belfrage Collection) is in the National Museum and a careful study of it shows that it is a Cryptine and not a Tryphonine, and in reality represents the male of *Mesostenus longicaudus* Cresson, a species which should be placed in the genus *Nematopodius* Gravenhorst, in my tribe *Mesostenini*. *Nematopodius longicaudus* Cresson is found from Texas to Canada and will doubtless be found to occur in Alaska.

Genus **Hypocryptus** Förster.

This genus is here recognized in our fauna for the first time.

TABLE OF SPECIES.

1. Head and thorax mostly black.
 - Abdomen more or less rufous, or with the middle segments rufous4.
 - Abdomen mostly black, none of the segments wholly rufous, although sometimes apically or medially striped or banded with rufous.....2.
2. Abdomen with a rufous stripe extending from base of second dorsal segment clear to the apex, dilated posteriorly and leaving the sides of the segment alone black3.

¹Trans. Amer. Ent. Soc., xxiv, p. 311, 1897.

Abdomen not so marked.

Face below the insertion of antennæ, cheeks, mandibles, palpi, tegulæ, a broad line in front of them on each lateral margin of the mesonotum, hind angles of pronotum, prosternum, mesosternum and the lower half of the mesopleura, the front and middle coxæ and trochanters, the second joint of hind trochanters and tibial spurs, lemon-yellow; rest of legs red; abdomen mostly black, the ventral fold and a spot at extreme apex of segments 3 to 7 yellowish. Male.....*H. kodiakensis*.

Face below the insertion of antennæ, cheeks, mandibles, palpi, tegulæ, a short line beneath a spot in front on each hind angle of pronotum, spot on prosternum, a line between the mesosternum and the mesopleura, dilated anteriorly and enclosing a black spot, the front and middle coxæ and trochanters, and the hind coxæ and trochanters *beneath*, lemon-yellow; rest of legs mostly rufous, the hind coxæ, trochanters and femora *above*, black, the hind tibiæ and tarsi fuscous, the middle tarsi above subfuscous. Male.

H. variegatipes.

3. Face below antennæ, except a black median line and two large black spots just above the clypeus, the clypeus, cheeks, mandibles, except tips, palpi, scape beneath, tegulæ, a broad line in front along the sides of the mesonotum, a line beneath, prosternum posteriorly, a broad line on each side of the mesosternum, the front and middle coxæ and trochanters, and the second joint of hind trochanters, lemon-yellow; rest of legs red. Female.....*H. popofensis*.
 4. Abdomen with the apex of first dorsal segment, the second and third entirely and the fourth or most of the fourth, rufous; sometimes with the second and third segments alone rufous.....5.
- Abdomen with the apex of the second dorsal segment and the third and fourth wholly rufous, the apex of the fourth sometimes black.

Face beneath antennæ, mandibles, palpi, scape and pedicel *beneath*, tegulæ, the scale in front, the front and middle legs, including coxæ and trochanters, tibial spurs and the hind trochanters and basal half of hind tibiæ lemon-yellow; hind coxæ and femora black, their tibiæ toward apex and their tarsi fuscous. *Female*.

H. seldoviae.

5. Hind coxæ black, the middle coxæ black only basally; face beneath, antennæ, mandibles, palpi, scape and pedicel beneath, scape in front, and the front and middle legs lemon-yellow, the hind legs, except coxæ and the apex of tibiæ, rufous. Male.....*H. seldoviae*.

Hind coxæ rufous, the middle and front coxæ yellow; face beneath, antennæ, except a slender black median line extending nearly to the base of the clypeus, mandibles, tegulæ, scape in front and the front and middle trochanters, lemon-yellow, rest of the legs, except the hind coxæ and tarsi which are fuscous, red; palpi white.

H. tibialis.

HYPOCRYPTUS KODIAKENSIS sp. nov.

Male.—Length 8 mm. Black with the face below the antennæ, including the clypeus, cheeks and mandibles, except teeth, the scape beneath, the pro- and mesosternum, the anterior and middle trochanters, tegulæ, a line below, the upper margin of the prothorax in front of the tegulæ, a hook-shaped line on each side of the mesonotum extending from the tegulæ anteriorly to the parapsidal depressions, a spot on the scutellum at apex, and a dot at the origin of the hind wings, lemon-yellow; palpi, tibial spurs and the hind trochanters, yellowish-white; rest of legs rufous. Wings hyaline, the stigma and veins dark brown. The head is opaque, finely coriaceous, the mesonotum is polished, impunctate; while the metathorax has two median carinæ, divergent posteriorly, the space between posteriorly being rugulose. The abdomen is elongate, subcylindrical, *above*, except a slight yellow stripe at the extreme apices of segments 3 to 7, black, *beneath* yellowish, with oblong black spots on segments 2 to 4. Antennæ above black, the flagellum beneath brownish.

Type.—Cat. No. 5631, U. S. Nat. Museum. From Kodiak, July 2. One specimen.

HYPOCRYPTUS VARIEGATIPES sp. nov.

Male.—Length 8 mm. Black, with the face below the antennæ, the cheeks, clypeus, mandibles, except teeth, scape and pedicel *beneath*, a line beneath tegulæ and a spot before, a spot on prosternum in front of the insertion of the coxæ, a broad line on each side of the mesosternum dilated anteriorly and enclosing a black spot, and the front and middle coxæ and trochanters lemon-yellow or yellowish-white; rest of front and middle legs, and the hind femora and tibiæ *beneath*, red; hind legs above black, the coxæ and trochanters *beneath* yellowish; flagellum beneath ferruginous; abdomen above black, with the extreme apices of segments 2 to 7, a median spot at base and apex of segments 2 and 3, that on the third being more or less conjointed to a median line, and a small median spot at apices of the following segments testaceous. Wings hyaline, the stigma, except a white spot at its base, and the veins brown.

Type.—Cat. No. 5632, U. S. Nat. Museum. From St. Paul Island, August 25 (Fur Seal Commission). One specimen.

HYPOCRYPTUS POPOFENSIS sp. nov.

Male.—Length 6.5 mm. Black; face, except a short median black spot just beneath the insertion of the antennæ and two large quadrate

spots just below it above the clypeus, the cheeks, mandibles, except teeth, and the scape and pedicel beneath, lemon-yellow; basal half of flagellum *beneath* and the apical half or more entirely ferruginous; tegulæ, a line beneath and a spot in front, a broad line on each side of the mesonotum, a large spot on prosternum in front of each coxa, a broad band on each side of the mesosternum, the front and middle coxæ and trochanters, and the tibial spurs, yellowish-white; rest of legs, except the hind tarsi red, the hind tarsi subfuscous. Wings hyaline, the stigma and subcostal vein yellowish, the internal veins brown.

Type.—Cat. No. 5633, U. S. Nat. Museum. From Popof Island, July 12. One specimen.

HYPOCRYPTUS SELDOVIÆ sp. nov.

Female.—Length 10 mm. Black, the abdomen with a median spot at apex of dorsal segment 2 and segments 3 and 4 entirely rufous; face below antennæ, scape and pedicel *beneath*, and the front and middle legs, except basally, lemon-yellow; hind coxæ and femora black, their tibiæ *above* and the tarsi fuscous or black, the tibiæ *beneath* reddish; flagellum, except a few of the basal joints *above* ferruginous; palpi, tegulæ, a small spot in front, the front and middle coxæ and trochanters and the hind trochanters yellowish-white. Wings hyaline, the subcostal vein, the parastigma and poststigmatal vein, yellowish, the stigma and the internal veins dark brown.

Male.—Length 9 mm. Differs from female in having the dorsal abdominal segments 2, 3 and 4 red, the base of the middle coxæ black, while the hind legs, except the hind coxæ which are black, and the trochanters *above* which are fuscous, are red.

Type.—Cat. No. 5634, U. S. Nat. Museum. From Seldovia, July 20; Kukak Bay, July 4.

HYPOCRYPTUS TIBIALIS sp. nov.

Male.—Length 8.5 mm. Black, the abdomen with dorsal segments 3 and 4 usually blotched with red, rarely wholly red, segment 5 with an obscure reddish spot at basal middle, while the extreme apices of segments 6 and 7 are yellowish; face below antennæ, except a median black line, the clypeus, cheeks, mandibles, except teeth, scape beneath, and a small spot in front of tegulæ, lemon-yellow; flagellum beneath ferruginous; palpi, tegulæ, front and middle coxæ and trochanters yellowish-white; rest of legs, except the hind tibiæ and tarsi, which are fuscous, red. Wings hyaline, the stigma and subcostal vein yellowish, the internal veins dark brown.

Type.—Cat. No. 5635, U. S. Nat. Museum. From Popof Island, July 4. One specimen.

Genus **Mesoleptus** Gravenhorst.

MESOLEPTUS UNALASKÆ sp. nov.

Female.—Length 7 mm. Black; face below antennæ, except a median black line, connected with a triangular black spot just above the clypeus, the cheeks, clypeus, mandibles, except teeth and a spot at base, the palpi, scape and pedicel beneath, tegulæ, epitegulæ, sutures of trochanters and the second joint of same, tibial spurs, venter and the extreme apices of dorsal abdominal segments 2 and 3 (nearly invisible unless viewed from behind) yellowish-white; flagellum beneath ferruginous; all coxæ and first joint of trochanters, at least above, black; rest of legs red. Wings hyaline, the stigma and subcostal vein yellowish, the internal veins brown.

Type.—Cat. No. 5636, U. S. Nat. Museum. From Unalaska, August 24 (Fur Seal Commission).

Tribe *CTENISCINI*.

Genus **Microplectron** Förster.

MICROPLECTRON ALASKENSIS sp. nov.

Male.—Length 3.6 mm. Black, the face, except a broad median line extending to the clypeus, clypeus, mandibles, scape and pedicel beneath, and apical median blotches on dorsal abdominal segments 2, 3 and 4, as well as the *extreme* apices of the following segments, lemon-yellow; palpi, tegulæ, apices of front and middle coxæ and *beneath*, their trochanters and the hind trochanters yellowish-white; front and middle coxæ basally and the hind coxæ black; rest of legs mostly rufous, the hind femora, tibiæ and tarsi brownish or subfuscous. Wings hyaline, the stigma and veins brown, the poststigmatal vein and subcostal veins, as well as the parastigma and the veins in the hind wings, pale yellowish.

Type.—Cat. No. 5637, U. S. Nat. Museum. From Popof Island, July 9. One specimen.

Genus **Cteniscus** Haliday.

TABLE OF SPECIES.

- | | |
|--|----|
| 1. Thorax and the head, at least above, black..... | 2. |
| Thorax not black | 5. |

2. Hind coxæ not black.....4.
Hind coxæ always black, the middle usually black only at base.
Face below the insertion of the antennæ yellow but *without* a median black line.....3.
Face below the insertion of the antennæ yellow but *with* a median black line that extends to base of clypeus.
Female: abdomen black but with the three or four apical segments, and segments 2 and 3 at apex, mostly rufous.....*C. clypeatus*.
Male: abdomen mostly black, with usually the apical margins of segments 2 and 3 and 6 and 7, rufous; there is also usually a median rufous spot on 3 and 4.....*C. clypeatus*.
3. Front and middle coxæ at apex, their trochanters and the hind trochanters yellowish-white; rest of coxæ, and the hind femora black, the hind tibiæ and tarsi subfuscous, the front and middle legs fulvous; abdomen black with the apex of the second segment, a broad median stripe on the third at apex, and the sutures of the following segments rufous.....*C. nigrofemoralis*.
4. None in this section from Alaska.
5. None in this section from Alaska.

CTENISCUS CLYPEATUS Cresson.

Cteniscus clypeatus CRESSON, Trans. Am. Ent. Soc., II, p. 113, ♀, 1869.

Mesoleptus concolor PROVANCHER, Nat. Can., VII, p. 139, 1875.—PROVANCHER, Fn. du. Can. Hym., p. 403, 1883.—CRESSON, Syn. Hym. North America, p. 212, 1887.—DAVIS, Trans. Am. Ent. Soc., XXIV, p. 228, 1897.

Type in collection of the American Entomological Society. From St. Paul Island, August 15 to 25 (Fur Seal Commission). Many specimens. Occurs in the White Mountains of N. H., the mountains of Colorado, Hudson Bay Territory and in Oregon and Washington.

CTENISCUS NIGROFEMORALIS sp. nov.

Male.—Length 7.8 mm. Black; face from some distance from below the antennæ, not immediately from their insertion, the clypeus, except a black sutural line, cheeks, the mandibles except the teeth, and scape and pedicel *beneath*, lemon-yellow; palpi, tegulæ, a small spot in front, epitegulæ, apices of front and middle coxæ, their trochanters, and the hind trochanters yellowish-white; rest of coxæ and hind femora black, the rest of the legs mostly reddish, the hind tibiæ and tarsi usually more or less obscured or subfuscous. Wings hyaline, the stigma, except at apex and base, and the internal veins brownish. Abdomen black with the apices of dorsal segments 2 and 3 and a median stripe on the second, rufo-testaceous.

Type.—Cat. No. 5638, U. S. Nat. Museum. From Kukak Bay, July 4. One specimen.

Genus **Diaborus** Förster.**DIABORUS SEXMACULATUS** sp. nov.

Male.—Length 10 mm. Black; face, except a median line connected with a black band across base of clypeus, the remainder of clypeus, spot on cheeks, epitegulæ, a line on upper margin of prothorax interrupted anteriorly, and spots, or bands at apices of dorsal abdominal segments 2 to 7, lemon-yellow; mandibles, except teeth, the palpi, tegulæ and front coxæ and trochanters, yellowish-white; rest of legs except as noted, reddish yellow, the hind coxæ and first joint of trochanters above black, the apex of the tibiæ and tarsi fuscous. Wings hyaline, the stigma and subcostal vein yellowish, the other veins dark brown.

Type.—Cat. No. 5639, U. S. Nat. Museum. From Popof Island, July 8. One specimen.

DIABORUS CITRIFRONS sp. nov.

Male.—Length 6 mm. Black; face below antennæ entirely, cheeks, mandibles, scape beneath, a line on upper margin of the prothorax, interrupted anteriorly, a short line beneath the tegulæ, scutellum, post-scutellum, and a triangular spot at apices of dorsal abdominal segments 1, 2 and 3, and bands at the apices of the following segments, lemon-yellow; palpi, tegulæ, a line on the lower margin of the prothorax, the front and middle coxæ and trochanters, the hind coxæ above and the second joint of their trochanters, yellowish-white; remainder of legs, except the hind tibiæ at apex and their tarsi red; the hind coxæ beneath and the first joint of the trochanters are black, the hind tibiæ at apex and their tarsi are fuscous. Wings hyaline; the stigma, except at base and the subcostal vein, which are yellowish, and the internal veins, dark brown.

Type.—Cat. No. 5640, U. S. Nat. Museum. From Popof Island, July 11. One specimen.

Tribe **CTENOPELMINI**.Genus **Erromenus** Holmgren.**ERROMENUS ANNULIPES** sp. nov.

Female.—Length 6.8 mm. Black; clypeus and legs, except as hereafter noted, red; mandibles, except teeth, epitegulæ and the subcostal vein, front and middle trochanters, except the first joint of the middle above, the tibial spurs, and the extreme apices of dorsal ab-

dominal segments 2 and 3 yellow or yellowish-white; palpi and an annulus of the hind tibiæ before the middle, white; coxæ, hind trochanters, apices of hind femora, their tibiæ, except the white annulus, and their tarsi black. Wings hyaline, the stigma and veins brown, the disco-cubital nervure broken by a distinct stump of a vein, the areolet complete.

Type.—Cat. No. 5641, U. S. Nat. Museum. From Popof Island, July 11. Two specimens.

Genus **Monoblastus** Hartig.

MONOBLASTUS NIGER sp. nov.

Male.—Length 7 mm. Black; mandibles with a rufous spot near the middle; palpi, epitegulæ and the subcostal vein, yellowish; apices of all femora and all tibiæ and tarsi, except the last three joints of the middle and hind tarsi, testaceous, the terminal joints mentioned being more or less fuscous, especially above. Wings hyaline, the stigma, except at base, and the veins dark brown; the disco-cubital vein is strongly curved, but has a short stump of a vein at its basal third. The head in front is closely confluent punctate, behind and on vertex it is smooth and shining, although sparsely punctate. The thorax above is sparsely but distinctly punctate, the metathorax rugulose, opaque, except the surface within the basal lateral areas which is smooth and shining.

Type.—Cat. No. 5642, U. S. Nat. Museum. From Popof Island, July 9. One specimen.

Genus **Polyblastus** Förster.

POLYBLASTUS GLACIALIS sp. nov.

Female.—Length 8 mm. Black; anterior half of clypeus, dorsal abdominal segments 2, 3 and 4, and the legs, except as hereafter noted, rufous; all coxæ and trochanters, the hind femora and their tibiæ at apex black, the hind tibiæ basally and their tarsi more or less yellowish, the tarsal joints at apex being fuscous; tegulæ dark piceous; the epitegulæ, subcostal vein, base of stigma and palpi, yellowish-white, the rest of the stigma and the internal veins brown. The face is finely, closely punctate, the basal half of the clypeus shining, with some coarse punctures; the thorax above is shining, although sparsely minutely punctate; the metathorax is rugulose, the carinæ strong, but with the basal middle and middle lateral areas confluent; while the first segment of the abdomen is rugulose with two dorsal carinæ that extend four-fifths its length.

Proc. Wash. Acad. Sci., May, 1902.

Type.—Cat. No. 5643, U. S. Nat. Museum. From St. Paul Island, August 17 (Fur Seal Commission). One specimen.

Genus **Scorpiorus** Förster.

SCORPIORUS ALASKENSIS sp. nov.

Female.—Length 5.5 mm. Black; a dot on cheeks, a triangular spot on anterior angles of face just above the clypeus, the clypeus, mandibles, scape beneath, the venter and the extreme apex of the sixth dorsal abdominal segment yellow; legs, except more or less of the coxæ above, a broad band at apex of the second dorsal abdominal segment, the third segment entirely, and the apex of the fourth, rufous; palpi, tegulæ, epitegulæ, subcostal vein, and a spot at the base of the stigma, ivory-white or yellowish-white. Wings hyaline, the stigma except as noted, and the internal veins, brown. Metathorax areolated, as in *Polyblastus glacialis*. Abdomen with the first segment broad, finely rugulose, the dorsal carinæ extending only to its middle.

Type.—Cat. No. 5644, U. S. Nat. Museum. From Popof Island, July 11. One specimen.

SCORPIORUS NIVEICOLA sp. nov.

Female.—Length 3.5 mm. Black; the clypeus, mandibles, palpi, tegulæ, epitegulæ, subcostal vein and the base of the median vein, white; legs and the first and second segments of the abdomen, brownish-yellow or reddish-yellow. Wings hyaline, the stigma and veins brown. Face smooth, shining, at the most sparsely and microscopically punctate medially. Thorax polished, impunctate, the scutellum elevated, with a deep transverse furrow across the base, the metathorax finely rugulose, carinate, the basal lateral and middle areas confluent. Abdomen smooth, shining, the first segment at the most alutaceous, the dorsal carinæ not extending beyond its middle.

Male.—Differs from female in having two broad white spots on face anteriorly, one on each side, that extend on to the cheeks; the scape and pedicel beneath are white; the apex of the hind tibiæ and their tarsi are fuscous; the abdomen has the second and third dorsal segments and the apex of the fourth, brownish-yellow, while the first segment is the longest with the dorsal carinæ extending nearly to its apex.

Type.—Cat. No. 5645, U. S. Nat. Museum. From Muir Inlet, June 12; Popof Island, July 9.

Tribe *TRYPHONINI*.Genus *Trematopygus* Holmgren.

TREMATOPYGUS KUKAKENSIS sp. nov.

Female.—Length 5 mm. Black; mandibles, except the teeth and a spot at base, the legs, except the coxæ and the hind tarsi, and dorsal abdominal 3 at apical half and 4 entirely, rufous; palpi, tegulæ, epitegulæ, subcostal vein, and base of stigma, yellowish-white. Head and thorax coriaceous, the metathorax rugulose, completely areolated. Abdomen with the petiole and second dorsal segment coriaceous, the following segments finely punctate, the dorsal carinæ of the petiole indistinct, close and nearly parallel.

Type.—Cat. No. 5647, U. S. Nat. Museum. From Kukak Bay, July 4. One specimen.

Genus *Cosmoconus* Förster.

COSMOCONUS CANADENSIS (Provancher).

Tryphon canadensis PROVANCHER, Nat. Can., VII, p. 117, 1875.

Mesoleius canadensis PROVANCHER, Fn. du Can. Hym., p. 417, 1883.—CRESSON, Syn. Hym. North America, p. 210, 1887.

Cosmoconus canadensis DAVIS, Trans. Am. Ent. Soc., XXIV, p. 280, 1897.—ASHMEAD, Smith's Ins. of New Jersey, p. 578, 1900.

Type.—In Parliament Building, Quebec, Canada. From Juneau, July 25. Two male specimens.

Genus *Tryphon* Gravenhorst.

TRYPHON ALASKENSIS sp. nov.

Female.—Length 6.8 mm. Black; anterior half of clypeus, mandibles, legs, except coxæ, trochanters, hind femora and apex of their tibiæ and their tarsal joints at tips, and dorsal abdominal segments 3, 4 and 5, rufous; coxæ, trochanters, hind femora, their tibiæ at apex and the apices of tarsal joints, fuscous; palpi, epitegulæ, subcostal vein and a spot at base of stigma, yellowish-white. Wings hyaline, the stigma and veins, except as noted, brown.

Type.—Cat. No. 5648, U. S. Nat. Museum. From St. Paul Island, August 25 (Fur Seal Commission).

Genus *Trophoctonus* Förster.

TROPHOCTONUS INSULARIS sp. nov.

Male.—Length 7.5 mm. Dark rufous, with the sutures of the thorax, prosternum, mesosternum, metathorax and the extreme base of

first abdominal segment with its dorsal carinæ, black; face with a spot at each anterior angle, clypeus, a spot at base of mandibles, epitegulæ, costæ, and a spot at base of stigma, ivory, or yellowish-white; legs ferruginous. Wings subfuscous, the stigma and veins, except as noted, brown. Face finely punctate, the vertex and the thorax smoother, shining but sparsely, minutely punctate; the prothorax in the lateral depressions is distinctly wrinkled; the metathorax is short but strongly and completely areolated; while the first and second dorsal segments of the abdomen are finely rugulose, the first with two strong dorsal carinæ that become obsolete at the apical third of the segment.

Type.—Cat. No. 5648, U. S. Nat. Museum. From Popof Island, July 9. One specimen.

Genus **Sychnoportus** Förster.

SYCHNOPORTUS LONGITARSIS sp. nov.

Male.—Length 4 mm. Black; face below antennæ, except a black line extending off oblique from the basal sutures of the clypeus on to the cheeks, the clypeus, the mandibles and the front and middle coxæ and trochanters lemon-yellow; the legs, except the middle coxæ above, the hind coxæ anteriorly, first joint of their trochanters, tips of their tibiæ and tarsi, which are black or fuscous, and the abdomen, except the basal two thirds of the first segment and segments 5, 6 and 7 which are black, are rufous. Wings hyaline, the stigma and veins brown.

Type.—Cat. No. 5649, U. S. Nat. Museum. From Kukak Bay, July 4. One specimen.

Genus **Tlemon** Förster.

TLEMON DELICATUS sp. nov.

Male.—Length 5 mm. Black; clypeus, mandibles, hypotegulæ and the epitegulæ lemon-yellow; palpi, tegulæ and the front and middle coxæ and trochanters, ivory or yellowish-white; hind coxæ black, first joint of hind trochanters above, apex of their tibiæ and their tarsi fuscous, the remainder of the legs reddish-yellow or brownish-yellow. Wings hyaline, the stigma and veins brown. Face feebly coriaceous, the clypeus highly polished, impunctate; thorax above and a spot on the middle of the mesopleura smooth, shining, impunctate while the metathorax is rugulose, not short, and incompletely areolated.

Type.—Cat. No. 5650, U. S. Nat. Museum. From Kukak Bay, July 4. One specimen.

Genus **Polyterus** Förster.**POLYTERUS SEXCARINATUS** sp. nov.

Female.—Length 8.5 mm. Black; clypeus and mandibles dark rufous; palpi yellowish, with the two basal joints brownish or fuscous; legs, except the hind tibiæ and tarsi, including tibial spurs ferruginous, hind tibiæ, their spurs and tarsi black. Head coriaceous opaque; thorax above shining, although microscopically punctate, the metathorax wrinkled but shining, and with six longitudinal carinæ, the two middle rather close at their origin but diverging posteriorly and uniting with the transverse apical carina, the space between being transversely rugulose and twice as wide at apex as at base. Wings hyaline, or only faintly tinged, the stigma and veins brown.

Type.—Cat. No. 5651, U. S. Nat. Museum. From Alaska (U. S. Coast and Geodetic Survey). Two specimens.

Genus **Hyposyntactus** gen. nov.

In a table of genera this new species will fall next to *Syntactus* Förster. The two may be separated as follows:

Clypeus with a transverse furrow at apex.

Metanotum *without* median carinæ; hind legs long, their tarsi thickened, the longer spur of the tibiæ not or rarely half the length of the basal tarsal joint; disco-cubital nervure not broken by a stump of a vein.....*Syntactus*.

Metanotum *with* two median carinæ forming an areola, which, however, is open at base; hind legs normal, the longer tibial spur of hind legs fully half the length of the basal tarsal joint; disco-cubital nervure angularly broken by a stump of a vein.....*Hyposyntactus*.

HYPOSYNTACTUS FLAVIFRONS sp. nov.

(Pl. x, fig. 4.)

Male.—Length 10 mm. Black; face below antennæ, mandibles, scape beneath, a line on collar above, a triangular spot on each side of the mesonotum anteriorly at the base of the parapsidal furrows, the tegulæ, hypo- and epitegulæ, a line beneath, a dot on each side of the prosternum in front of the front coxæ, a spot on mesoternum, the front and middle legs, the hind trochanters, basal two thirds of hind tibiæ and their tarsi except last joint, and dorsal abdominal segments 2, 3 and 4, except narrowly at apex, lemon-yellow. Wings hyaline, the stigma within yellowish, outwardly as well as the internal veins, brown, the disco-cubital nervure angularly broken by a stump of a vein before the middle.

Type.—Cat. No. 5652, U. S. Nat. Museum. From Juneau, July 25. One specimen.

In color and general appearance this species very closely resembles *Cosmoconus canadensis* Provancher, and one must give the closest attention to its structural characters or it might be easily confounded with it.

Genus *Calliphrurus* Förster.

Prior to the Harriman Expedition only a single species belonging to this genus was known in North America.

In the Alaskan material ten additional species have been discovered, which may be tabulated as follows :

TABLE OF SPECIES.

1. Head and thorax black.

Abdomen not entirely black ; dorsal segments more or less rufous. 8.

Abdomen black or at most with only the extreme apex of one or more of the segments whitish or testaceous.....2.

2. All coxæ black.....3.

Not all the coxæ black.....5.

3. Smaller species, less than 6 mm. or no longer.....4. Larger species, more than 6 mm. long.

Legs rufous with the front and middle trochanters, the second joint of hind trochanter, tibial spurs, palpi, tegulæ, and ventral fold yellowish-white ; coxæ, hind femora, base and apex of their tibiæ and tarsi black.

Abdomen above black with the apices of the second and third segments nearly yellowish ; clypeus and mandibles yellow ; no spot in front of each lateral mesothoracic lobe. Female.....*C. clypeatus*.

Abdomen with dorsal segments 2 to 6 or 7, narrowly at apex flavo-testaceous, the third and fourth usually also with a large median spot toward apex ; clypeus, mandibles and a spot on scape beneath yellow ; legs rufous. Male.....*C. clypeatus*.

Legs rufous, with the trochanters, except first joint *above*, palpi, tegulæ and ventral fold yellowish-white ; tibial spurs testaceous ; coxæ, basal joint of trochanters above, tips of hind tibiæ and tarsi black or fuscous.

Clypeus, mandibles and a triangular mark in front of each lateral mesothoracic lobe that extends slightly on to the angles of the middle lobe, yellow. Female.....*C. alaskensis*.

Clypeus, mandibles and tegulæ yellow or yellowish ; mesonotum immaculate ; flagellum, except two or three basal joints, ferruginous. Female.....*C. affinis*.

4. All coxæ black.

Legs rufous, the coxæ, first joint of trochanters and hind tarsi (sometimes) black; clypeus and mandibles, except teeth, tegulæ, and the extreme apices of dorsal abdominal segments 3 to 7, yellowish-white; flagellum ferruginous. Female.....*C. minor*.

Legs brownish-yellow, with the middle and hind femora more or less dusky or blackish; clypeus and mandibles yellowish; flagellum brown-black. Male.....*C. minor*.

5. Hind coxæ alone black.....6.

All coxæ rufous or pale, never black7.

6. Face below the antennæ, but not along the orbits and on the cheeks, the clypeus, mandibles, palpi, tegulæ, front and middle coxæ and trochanters, second joint of hind trochanters and tibial spurs, yellowish-white; flagellum brown-black. Female.....*C. popofensis*.

7. Legs rufous, with the hind tibiæ and tarsi more or less black or fuscous, the hind tibiæ with a rufous spot or broad band before the middle; clypeus, mandibles, except teeth, and the hind angles of pronotum, pale yellowish; tegulæ brown. Female.....*C. kukakensis*.

Legs pale ferruginous, with the tips of hind tibiæ and tarsi black or fuscous, the front and middle coxæ and all trochanters yellowish-white; face below antennæ including the clypeus, mandibles, a large spot on each side of mesonotum anteriorly, tegulæ, and a V-shaped mark on each side of the mesosternum yellow. Male.....*C. perplexus*.

8. All coxæ pale 11.

Hind coxæ black.....9.

9. Hind coxæ black.

Dorsal abdominal segments 2 to 7 mostly rufous or rufous in part.....10.

Dorsal abdominal segments mostly black, with 2 to 7 narrowly flavo-testaceous at apex.

Face entirely, a large spot on each side of the mesonotum anteriorly and a large triangular mark on each side just above the mesosternum lemon-yellow. Male.....*C. alaskensis*.

10. Clypeus, a lunate mark above and connected with it, mandibles, except teeth, palpi, tegulæ, front and middle coxæ and trochanters, and the tibial spurs, yellow or yellowish-white; remainder of legs except the apex of hind tibiæ and their tarsi, which are black, rufous. Male.

C. glacialis.

Face below antennæ, clypeus, mandibles, scape beneath, a large spot on anterior lateral margins of the mesonotum, a spot on each side of mesosternum anteriorly, and the tegulæ lemon-yellow; palpi, front and middle coxæ, apex of hind coxæ and all trochanters, except the first joint of the hind pair above, and the venter, yellowish-white. Male.....*C. frigidus*.

11. Face below antennæ, clypeus, mandibles, a spot on each side of the mesonotum anteriorly (sometimes Λ -shaped), the tegulæ, a spot in front and a line below, and front and middle coxæ and trochanters, yellowish-white; apex of hind tibiæ and their tarsi black; remainder of legs rufous; antennæ beneath ferruginous. Male..... *C. confusus*.

CALLIPHURUS CLYPEATUS sp. nov.

Female.—Length 6.5 mm. Black; clypeus and mandibles lemon-yellow; palpi, tegulæ, hypo- and epitegulæ, front and middle trochanters and second joint of hind trochanters, tibial spurs and the venter ivory or yellowish-white; all coxæ, first joint of hind trochanters, base and tips of their tibiæ and the hind tarsi black; hind femora dark, rufo-piceous, rest of legs reddish. Wings hyaline, the stigma, except a spot at base, and the veins brown.

Male.—Length 7.5 mm. Agrees well with the female, except that the legs are entirely red, except the coxæ and the first joint of the trochanters; the first joint of the front and middle trochanters at apex and the second joint are white, while the dorsal abdominal sutures 4 to 7, as well as a median spot at apex of segments 3 and 4, are testaceous.

Type.—Cat. No. 5653, U. S. Nat. Museum. From Kodiak, July 20; St. Paul Island (Fur Seal Commission).

CALLIPHURUS ALASKENSIS sp. nov.

Female.—Length 8 mm. Black; clypeus, mandibles, and a triangular spot on each side of the mesonotum anteriorly, lemon-yellow; palpi, tegulæ, apices of coxæ, first joint of trochanters beneath, the second joint entirely, and the venter ivory or yellowish-white; coxæ, first joint of trochanters above, apical third of hind tibiæ and their tarsi black; rest of legs red.

Male.—Differs from the female in having the entire face below the antennæ, a large spot on each side of the mesonotum, the hypo- and epitegulæ, and a band on each side of the mesosternum dilated anteriorly and enclosing a black spot, lemon-yellow; palpi, tegulæ, front and middle coxæ and trochanters and hind trochanters, except first joint at base above, ivory or yellowish-white; abdominal sutures, or along the sutures 2 to 7, and an obscure spot at base and apex of the third and sometimes on the fourth, flavo-testaceous; otherwise it is similar to the female.

Type.—Cat. No. 5654, U. S. Nat. Museum. From Popof Island, July 11.

CALLIPHRURUS AFFINIS sp. nov.

Female.—Length 6 mm. Allied to and closely resembling *C. alaskensis*, and agreeing with it in the color of abdomen and legs, but differs as follows: The clypeus, mandibles and tegulæ are yellow, the mesonotum immaculate, without the yellow spot on each side anteriorly, while the flagellum, except two or three of the basal joints, is ferruginous. It is also considerably smaller, the extreme apical margins of dorsal abdominal segments 2 to 7 being whitish and the antennæ are shorter.

Type.—Cat. No. 5655, U. S. Nat. Museum. From St. Paul Island, August 15 (Fur Seal Commission).

CALLIPHRURUS MINOR sp. nov.

Female.—Length 4.5 mm. Black; clypeus and mandibles, except teeth, testaceous; palpi and tegulæ white; flagellum ferruginous; legs, except coxæ and first joint of trochanters rufous; venter at the sutures and more or less of the ventral fold pale yellowish, while the dorsal abdominal segments 4 to 7 are narrowly whitish at apex. Wings hyaline, the stigma and veins pale yellowish.

Male.—Agrees well with the female except that the legs are brownish-yellow or reddish-yellow, the middle femora dusky basally, the coxæ, first joint of trochanters and the hind femora black, while the dorsal abdominal segments at apex are black, not narrowly white, except a small triangular spot at the lateral apical angles of the first segment.

Type.—Cat. No. 5656, U. S. Nat. Museum. From St. Paul Island, August 20, 24 (Fur Seal Commission).

CALLIPHRURUS POPOFENSIS sp. nov.

Female.—Length 6.5 mm. Black; abdomen with the second dorsal segment narrowly testaceous at apex, the following segments, if viewed from behind, showing a little white at their extreme apices; face immediately beneath the antennæ, but not along the orbits or on the cheeks, the clypeus, mandibles, palpi, tegulæ, a spot in front, front and middle coxæ and trochanters, second joint of hind trochanters, and the tibial spurs, yellow or yellowish-white; flagellum brown black. Wings hyaline, the stigma and veins dark brown.

Type.—Cat. No. 5657, U. S. Nat. Museum. From Popof Island, July 11. One specimen.

CALLIPHRURUS KUKAKENSIS sp. nov.

Female.—Length 6.5 mm. Black, with the extreme apex of dorsal abdominal segments 2, 3 and 5 narrowly whitish when viewed from behind; clypeus, mandibles, except teeth, and the hind angles of the pronotum, pale yellowish; legs except the hind tibiæ, tibial spurs and tarsi, which are black, rufous, the hind tibiæ usually with a rufous stripe or band before the middle. Wings hyaline, the stigma, except a pale spot at base, and the veins brown.

Type.—Cat. No. 5658, U. S. Nat. Museum. From Kukak Bay, July 10. One specimen.

CALLIPHRURUS PERPLEXUS sp. nov.

Male.—Length 6 mm. Black, with dorsal abdominal segments 2 to 7 more or less testaceous or whitish at their extreme apices; face beneath antennæ, clypeus, cheeks, mandibles, except teeth, scape beneath, a large spot on each side of the mesonotum anteriorly, tegulæ, and a V-shaped mark on each side of the mesosternum, lemon-yellow; legs pale ferruginous, with the hind tibiæ apically and their tarsi black or fuscous, while the front and middle coxæ, all trochanters and venter, pale yellowish or ivory white. Wings hyaline, the stigma and veins brown.

Type.—Cat. No. 5659, U. S. Nat. Museum. From Popof Island, July 10. One specimen.

CALLIPHRURUS GLACIALIS sp. nov.

Male.—Length 7 mm. Black, with dorsal abdominal segments 2 to 7 more or less rufous, 5, 6 and 7 very narrowly at apex; clypeus, a lunate mark just above it on face, mandibles, except teeth, and a spot on scape beneath yellow; legs rufous, with the hind coxæ, apex of hind tibiæ and their tarsi, black, the anterior and middle coxæ and trochanters, pale yellowish or yellowish-white.

Type.—Cat. No. 5660, U. S. Nat. Museum. From Juneau, July 25. One specimen.

CALLIPHRURUS FRIGIDUS sp. nov.

Male.—Length 8 mm. Black, with dorsal abdominal segment 2 at apex, and the following segments rufo-testaceous; face below antennæ, clypeus, cheeks, mandibles, except teeth, scape beneath, a large triangular spot on each side of the mesonotum, a spot on each side of the mesosternum, and the tegulæ, lemon-yellow; palpi, front and

middle coxæ, apex of hind coxæ and all trochanters, except the first joint of the hind trochanters above at base, and the venter, yellowish-white; remainder of leg rufous. Wings hyaline, the stigma within yellowish, outwardly and the other veins brown.

Type.—Cat. No. 5661, U. S. Nat. Museum. From Popof Island, July 10. One specimen.

CALLIPHURUS CONFUSUS sp. nov.

Male.—Length 7 mm. Black, with dorsal abdominal segment, 2 at apex, and segments 3, 4 and 5 almost entirely rufous, the fifth blackish laterally; face below antennæ, clypeus, mandibles, scape beneath, a large hook-shaped spot on each side of the mesonotum, tegulæ, a spot in front and a short line beneath, lemon-yellow; palpi, front and middle coxæ and trochanters and second joint of hind trochanters, yellowish-white; remainder of legs, except the apex of hind tibiæ and their tarsi which are black, rufous; ventral fold pale yellowish-white. Wings hyaline, the stigma and veins brown.

Type.—Cat. No. 5662, U. S. Nat. Museum. From Kukak Bay, July 4. Two specimens.

Genus *Gemophaga* Förster.

GEMOPHAGA RUFA sp. nov.

Male.—Length 7.5 mm. Rufous; sutures of the thorax and the pro- and mesosternum black; mandibles yellowish-white. Wings subfuscous, the stigma, except a yellowish spot at base, and the veins brown.

The metathorax is short but strongly and completely areolated, the carinæ sharply elevated, the spiracles large, broadly oval. Abdomen, except the first two segments and base of the third, is smooth and shining, the first two segments shagreened, the first with two strong dorsal carinæ.

Type.—Cat. No. 5663, U. S. Nat. Museum. From Popof Island, July 12. One specimen.

Genus *Mesoleius* Holmgren.

MESOLEIUS STEJNEGERI Ashmead.

Mesoleius stejneri ASHMEAD, Fur Seals and Fur Seal Islands, iv, p. 337, ♀, 1899.

Type.—Cat. No. 3651, U. S. Nat. Museum. From Bering Island (Dr. L. Stejneger); Pribilof Islands (Fur Seal Commission).

MESOLEIUS ALEUTIANUS Cresson.

Mesoleius aleutianus CRESSON, Proc. Acad. Nat. Sci. Phila., p. 371, ♂, 1878.
—CRESSON, Syn. Hym. N. Am., p. 209, 1887.

Type in collection of the American Entomological Society. From Aleutian Islands.

I have not recognized this species nor have I seen the type. Mr. Davis says it belongs to the genus *Lampronotus* Haliday, but the description alone shows that such cannot possibly be the case. It may, however, represent a male in some other genus in the tribe *Lissonotini*.

Tribe *BASSINI*.Genus *Bassus* Gravenhorst.

BASSUS PULCHRIPES Provancher.

Bassus pulchripes PROVANCHER, Fn. du Can. Hym., p. 428, 1883.—CRESSON, Syn. Hym. N. Am., p. 214, 1887.—DAVIS, Trans. Am. Ent. Soc., XXII, p. 20, ♀ ♂, 1895.

Type in Parliament Building, Quebec, Canada. From Muir Glacier. One female specimen. This species is found in Canada, Colorado and the White Mountains, New Hampshire.

Genus *Promethes* Förster.

PROMETHES UNICINCTUS sp. nov.

Female.—Length 5 mm. Black; a median spot on the ridge just below the insertion of the antennæ, the mandibles, hind angles of pronotum, a line beneath tegulæ, and a band at base of third abdominal segment and apex laterally, lemon-yellow; palpi, tegulæ, apices of front and middle coxæ and trochanters, and the second joint of hind trochanters yellowish-white; coxæ, except as noted, black; rest of legs, except the base of femora beneath, rufous. Wings hyaline, the stigma and costal vein yellowish, the subcostal and internal veins brown. Abdomen strongly compressed at apex, the basal segment rugulose, the second striate, the following smooth and polished.

Type.—Cat. No. 5664, U. S. Nat. Museum. From Kukak Bay, July 4. One specimen.

Genus *Bioblapsis* Förster.

BIOBLAPSIS TRICINCTA sp. nov.

Male.—Length 5.5 mm. Black; anterior orbits to summit of eyes, a rounded spot on middle of face, clypeus, mandibles, and three bands

on the abdomen, lemon-yellow; palpi, scape, pedicel and first joint of flagellum *beneath*, tegulæ, a spot in front, epitegulæ, apices of front and middle coxæ and trochanters, second joint of hind trochanters, and more or less of the front femora and tarsi *beneath*, yellowish-white; rest of coxæ black, remainder of legs mostly rufous, the femora with a blackish spot or stripe toward base beneath, the femora and tibiæ *outwardly* fuscous. Wings hyaline, the stigma and veins brownish.

Type.—Cat. No. 5665, U. S. Nat. Museum. From Berg Bay, June 10. One specimen.

Zootrepes Förster.

ZOOTREPES INSULARIS sp. nov.

Male.—Length 6 mm. Black; face below antennæ, clypeus, cheeks, mandibles, a U-shaped mark on mesonotum connected with a band on lateral margins, a dot on pronotum above, a spot in front of tegulæ, the epitegulæ, a spot beneath tegulæ, prosternum, mesosternum, except a large black spot posteriorly, the apical half of hind coxæ, the venter narrowly along the lateral margins, extreme apex of dorsal abdominal segment 2, most of 3, except a lateral black spot, and a median line on dorsal segment 4, lemon-yellow; palpi, tegulæ, front and middle coxæ and trochanters and hind trochanters yellowish-white; basal half of hind coxæ black, the remainder of the legs, except the hind pair, which are dusky behind, rufous; flagellum ferruginous, dusky above.

Type.—Cat. No. 5666, U. S. Nat. Museum. From Popof Island, July 8. One specimen.

Genus Phthorina Förster.

PHTHORINA BOREALIS sp. nov.

Male.—Length 4 mm. Polished black, the metathorax incompletely areolated; mandibles and legs from the apex of the femora and the apices of ventral abdominal segments, rufo-testaceous; palpi and epitegulæ yellowish-white, tegulæ black. Wings hyaline, the stigma, except a yellowish spot at base, and the veins dark brown. Abdomen, except the first segment, smooth and polished, the first segment feebly wrinkled and with two dorsal carinæ on the basal half.

Type.—Cat. No. 5667, U. S. Nat. Museum. From Popof Island, July 9. One specimen.

Genus **Enizemum** Förster.

ENIZEMUM TIBIALE (Cresson).

Bassus tibialis CRESSON, Trans. Am. Ent. Soc., II, p. 110, ♀, 1868.—CRESSON, Syn. Hym. North Am., p. 214, 1887.

Enizemum tibiale DAVIS, Trans. Am. Ent. Soc., XXII, p. 27, ♀♂, 1895.

Type in collection of the American Entomological Society. From St. Paul Island (Fur Seal Commission). Occurs also in Canada, Montana, Colorado, Kansas and Illinois.

Genus **Homotropus** Förster.

HOMOTROPUS ALASKENSIS sp. nov.

Female.—Length 5.5 mm. Black; a spot just above clypeus, the clypeus, mandibles, scape and pedicel beneath, a band on each side of the mesonotum, a spot in front of tegulæ and a line beneath, most of the coxæ and trochanters, the venter, and the second and third dorsal sutures of abdomen more or less lemon-yellow; basal half of hind coxæ and the front and middle coxæ basally, black; remainder of legs mostly ferruginous, the front and middle femora and tibiæ more or less streaked with yellow, the basal joints of trochanters and all femora at base *beneath* fuscous. Wings hyaline, the stigma, except along the outer margin, yellowish, costæ and internal veins brownish. Abdomen, except the first and second segments and the base of the third, smooth and shining; first and second segments rugulose, the first the more coarsely, the third feebly sculptured at base only.

Type.—Cat. No. 5669, U. S. Nat. Museum. From Popof Island, July 10, 14. Five specimens.

Tribe **ORTHOCENTRINI**.Genus **Synoplus** Förster.

SYNOPLUS BREVIPENNIS sp. nov.

(Pl. XI, fig. 2.)

Female.—Length 2.5 mm. Polished black; mandibles rufous; palpi pale fuscous, the last joint sometimes darker; legs ferruginous, the femora and hind coxæ usually, but not always, obfuscated, the trochanters and tibial spurs pale yellowish.

Antennæ 21-jointed, usually light brownish with the scape and terminal joints darker or fuscous; the first joint of the flagellum is the longest, a little longer than the second, or about $2\frac{1}{2}$ times as long as thick at apex, the following joints to the seventh very imperceptibly

shortening, the joints beyond to the last being quadrate or subquadrate, not longer than wide or a little wider than long, the last joint cone-shaped. Wings much abbreviated and narrowed, not reaching to or much beyond the middle of the abdomen; the tegulæ are pale yellowish or yellowish-white; the stigma and veins are brown, while the marginal cell is usually, but not always, closed. The metathorax is smooth, or at most alutaceous at apex and laterally, with the apical transverse carina distinct although delicate. The abdomen is strongly compressed from the second segment, shining black except the ventral segments at apex which are pale yellowish or whitish; the first segment laterally and at apex is finely, feebly shagreened; the second segment is feebly sculptured at its extreme base and within the basal lateral angles only; while the following are all smooth, impunctured.

Type.—Cat. No. 5670, U. S. Nat. Museum. From St. Paul Island, August (Fur Seal Commission). Fourteen specimens.

SYNOPLUS PLEURALIS sp. nov.

Female.—Length 2 mm. Polished black, with the pleura, metathorax, first segment of abdomen and legs light brown or brownish-yellow, the palpi and tegulæ white.

The antennæ are 20-jointed, the scape fuscous, the flagellum light brown. Wings much abbreviated and narrowed and very similar to those in *S. brevipennis*, except that the stigma is scarcely developed and the veins are much paler, nearly hyaline or with a yellowish tinge.

Type.—Cat. No. 5671, U. S. Nat. Museum. From St. Paul Island (Fur Seal Commission).

Genus *Hypoleptus* Förster.

HYPOLEPTUS ALASKENSIS sp. nov.

Female.—Length 2 mm. Polished black; mandibles, palpi and annulus at base of the flagellum, sutures of trochanters and the second joint, knees, and the tibiæ and tarsi, brownish-yellow, the apex of the hind tibia and their tarsi subfuscous; flagellum brown; apices of ventral abdominal segments whitish. Wings hyaline, the stigma and veins light brown. The antennæ are 18-jointed, the flagellum very gradually thickening towards apex; the first joint of the flagellum is the longest, about $3\frac{1}{2}$ times as long as thick at apex, a little narrowed towards base, the following gradually shortening and thickening, the three before the last being a little wider than long.

Male.—Length 3.4 mm. Differs from the female in having a longer more clavate abdomen, with the first and second dorsal seg-

ments more or less wrinkled or shagreened, while the flagellum is longer, filiform, the joints being cylindrical, subequal in length, about thrice as long as thick.

Type.—Cat. No. 5672, U. S. Nat. Museum. From St. Paul Island, August 22; Belkofski, July 7 (Fur Seal Commission). Fifteen specimens.

HYPOLEPTUS GLACIALIS sp. nov.

Male and Female.—Length 2.5 to 3 mm. Polished black; palpi brownish or fuscous; mandibles, a minute annulus at base of flagellum, sutures of trochanters and the second joint, knees and base of tibiæ yellowish, remainder of legs black or brownish-black; tegulæ and bands on venter yellowish-white. Wings hyaline, the costal vein to the parastigma black or piceous black, the stigma and internal veins brown.

The antennæ are long, 22-jointed (rarely 23-jointed); the flagellum except the annulus at base of first joint is brown-black, the first three or four joints subequal, about thrice as long as thick. The metathorax is about one and a half times as long as wide, feebly alutaceous towards apex, smooth at base above and with a distinct apical transverse carina. The abdomen is elongate, longer than the head and thorax united, polished, except the first and second dorsal segments which are aciculated along the lateral margins; the second has also two oblique furrows or impressed lines.

Type.—Cat. No. 5673, U. S. Nat. Museum. From Muir Inlet, June 12.

Genus **Neuroteles** Ratzeburg.

NEUROTELES DUBIOSUS sp. nov.

Male.—Length 4.2 mm. Polished black; two spots on face superiorly just beneath the antennæ, the labrum, mandibles, sutures of trochanters and the second joint, knees of front and middle legs, base of hind tibiæ, and the front and middle tibiæ and tarsi, pale yellowish; front and middle coxæ *beneath* brownish; palpi pale; tegulæ, epitegulæ, the longitudinal veins in front wings basally, and more or less of the ventral fold yellowish-white.

The antennæ are 28-jointed; the flagellum is brown-black, with the first three or four joints subequal, about $3\frac{1}{2}$ times as long as thick. The metathorax is smooth and shining, except apically and laterally where it is alutaceous or finely, irregularly wrinkled, the pleural carina being faintly indicated posteriorly. The abdomen is elongated and narrowed, twice the length of the thorax, the sides to near the apex

being parallel, the first and second segments shagreened, the first one third longer than the second, the following segments smooth and polished, the third segment a little shorter than the second.

Type.—Cat. No. 5674, U. S. Nat. Museum. From St. Paul Island, August 25 (Fur Seal Commission).

In describing this new species of *Neuroteles*, as defined to suit our American species, the opportunity is taken to state my disagreement with Mr. Davis in his removal of *Neuroteles americana*, *N. ulmicola* and *N. liriodendri* to the genus CAMEROTOPS Förster, as also in making the last two synonymous with *Brephoctonus flavosus* Ashm.; all are distinctly different.

Mr. Davis has overlooked important cephalic and metathoracic differences not readily appreciated by a beginner.

Genus **Deleter** Förster.

DELETER KINCAIDI sp. nov.

Female.—Length 2 mm. Polished black; apex of second dorsal abdominal segment and the third segment entirely testaceous; antennæ, except scape above, and the legs brownish, the trochanters, knees, base of tibiæ and the tarsi paler or yellowish; palpi white; tegulæ and stigma pale yellowish, the costæ and internal veins dark brown.

The antennæ are 22-jointed, slightly thickened toward apex, the five or six joints before the last being quadrate or nearly so, not or scarcely longer than thick, the first three or four basal joints of the flagellum being a little more than twice longer than thick, narrowed toward base.

Abdomen, except the first segment, smooth, impunctate, the first finely aciculate, the second with two oblique depressions basally.

Male.—Differs from female in having the antennæ filiform, the 5 or 6 terminal joints longer than thick, the abdomen, except the first segment being brownish-piceous, while the legs, except the hind coxæ and femora and tips of hind tibiæ, are yellowish, the hind coxæ and femora black, the tips of the hind tibiæ fuscous.

Type.—Cat. No. 5754, U. S. Nat. Museum. From Belkofski, July 22 (Fur Seal Commission).

DELETER FLAVIFRONS sp. nov.

Male.—Length 3 mm. Polished black; face below antennæ, mandibles and two stripes on the scape lemon-yellow; palpi, tegulæ, a dot in front, epitegulæ, apex of front coxæ, their trochanters, their femora except stripe beneath the tibiæ and tarsi *beneath*, sutures of middle and

hind trochanters, basis of their tibiae, the tarsal joints more or less basally, and the first ventral abdominal segment and along the sutures of the second pale yellowish. Wings hyaline, the costae brown-black, the stigma and internal veins brown.

The antennae are 24-jointed, about as long as the body, filiform, brown-black; the first two joints of the flagellum are subequal, about $2\frac{1}{2}$ times as long as thick, the following to the last very gradually and imperceptibly shortening, the penultimate being very little longer than thick, the last fusiform, nearly as long as the two preceding united. Metathorax smooth, shining, at the most feebly aciculate posteriorly, the apical transverse and the pleural carinae distinct. Abdomen, except the first segment, and the second feebly at base, smooth and shining, the first longitudinally aciculate, the second feebly and faintly aciculate at base only.

Type.—Cat. No. 5675, U. S. Nat. Museum. From Popof Island, July 10; St. Paul Island, August 24 (Fur Seal Commission).

Genus *Tapinops* Förster.

TAPINOPS CALIFORNICUS (Ashmead).

Orthocentrus californicus ASHMEAD, Proc. U. S. Nat. Mus., XII, p. 442, ♀, 1888.

Tapinops californicus ASHMEAD, Trans. Am. Ent. Soc., XXIII, p. 204, 1896.

Tapinops emarginatus DAVIS, nec Say, Trans. Am. Ent. Soc., XXIV, p. 222, 1897.

Tapinops abdominalis DAVIS, nec Provancher, loc. cit.

Tapinops pusillus DAVIS, nec Walsh, loc. cit.

From Sitka. Very common in the mountains of California.

Mr. Davis is clearly wrong, in making this species, and others, noted above, synonymous with *Ophion marginatus* Say, a species he never saw and which from Say's description cannot possibly belong to this genus. Long after his original description was published, Say wrote, "This species is very remarkable by the prominence of the head in front of the insertion of the antennae which hence appear to be situated in a deep foveola; this character, together with the very short, robust feet proves a close relationship to *Alomya* to which in fact I would refer the species, but that there is *no appearance of a second cubital cellule; the antennae have 36 joints.*" (Italics mine.)

Tapinops californicus Ashmead has an areolet or second cubital cell and the antennae have only 29 joints. Davis evidently overlooks this note on Say's species.

I have recognized Say's species; it does not even belong to this tribe, but belongs to a genus in the next tribe or the *Exochini*.

Genus **Atmetus** Förster.**ATMETUS INSULARIS** Ashmead.

Atmetus insularis ASHMEAD, Fur Seals and Fur Seal Islands, IV, p. 337, ♀, 1899.

Type.—Cat. No. 4039, U. S. Nat. Museum. From Muir Inlet, June 12; St. Paul Island, August 22 (Fur Seal Commission). Originally described from Copper Island, in Bering Sea.

The male has the upper half of the face, the clypeus, the mandibles and a spot in front of the tegulæ, lemon-yellow; the front and middle coxæ and trochanters and the hind trochanters are yellowish-white; while the antennæ are 27-jointed, the flagellum brown-black, beneath towards base fulvous.

Genus **Orthocentrus** Gravenhorst.**ORTHOCENTRUS NIGRITUS** sp. nov.

Male.—Length 2.5 mm. Polished black; face below the antennæ but not the cheeks, lemon-yellow; mandibles testaceous; tegulæ and epitegulæ yellowish-white; legs mostly black with the front coxæ, trochanters, femora and tibiæ, except above, the sutures of middle coxæ and trochanters, apex of middle femora and the base of middle and hind tibiæ, rufo-testaceous; wings hyaline, the stigma and veins brown; abdomen, except the first dorsal segment and base of second, polished and impunctate; the first segment is longitudinally aciculated except a smooth longitudinal median space towards its base, while the second segment is aciculate from the basal oblique furrows, smooth and polished beyond.

Type.—Cat. No. 5676, U. S. Nat. Museum. From St. Paul Island, August 22 (Fur Seal Commission). One specimen.

Genus **Phænosemus** Förster.**PHÆNOSEMUS SITKENSIS** sp. nov.

Male.—Length 4 mm. Polished black, the face distinctly, although somewhat sparsely, punctate; the upper margin of the facial elevation, mandibles, palpi, scape, tegulæ, apices of coxæ, the trochanters, knees and ventral fold yellow; remainder of legs brownish-yellow except the coxæ which are black, the hind femora which are brown-black, the middle and front femora basally and the terminal joints of the tarsi which are fuscous or dusky. The abdomen has the dorsal sutures 2, 3 and 4 yellowish. Wings hyaline, the stigma and veins brown, the closing vein of the areolet being pallid or subhyaline. The

metathorax is smooth but areolated, the lateral longitudinal carinæ being distinct from the spiracles, the pleural and two middle carinæ also distinct. The abdomen, except the first and second dorsal segments which are finely sculptured, is smooth and shining; the dorsal carinæ of the first segment extend almost to the apex of the segment.

Type.—Cat. No. 5677, U. S. Nat. Museum. From Sitka, July 16. One specimen.

Genus **Stenomærus** Förster.

STENOMÆRUS BOREALIS Ashmead.

Stenomærus borealis ASHMEAD, Fur Seals and Fur Seal Islands, iv, p. 338, 1899.

Type.—Cat. No. 4040, U. S. Nat. Museum. From Bering Island (Dr. L. Stejneger); Popof Island, Muir Inlet and Kukak Bay (Harriman Expedition); St. Paul Island and Unga Island (Fur Seal Commission).

Genus **Camarotops** Förster.

CAMAROTOPS KODIAKENSIS sp. nov.

Female.—Length 2.5 mm. Polished black, the face very sparsely microscopically punctate, the first dorsal segment of abdomen and the second segment except at apical third, strongly, irregularly, longitudinally aciculated; extreme superior margin of the frontal elevation testaceous; palpi and tegulæ white; mandibles testaceous; legs clear reddish-brown, the hind femora much swollen. Wings hyaline, the stigma and veins brown. Antennæ 24-jointed, brown, becoming black toward apex.

Type.—Cat. No. 5678, U. S. Nat. Museum. From Kodiak. One specimen.

Neuroteles americana, *N. liriodendri* and *Blephoctonus flavosus*, are erroneously placed by Davis in this genus; they belong in the genera in which they were originally placed.

Tribe **EXOCHINI**.

Genus **Triclistus** Förster.

TRICLISTUS CURVATOR (Fabricius).

Ichneumon curvator FABRICIUS, Ent. Syst., p. 179, 1775.

Exochus curvator GRAVENHORST, Ichn. Eur., II, p. 335, 1829.—STEPHENS, Illustr., VII, p. 265, 1828–46.—HOLMGREN, Svensk. Akad. Handl., p. 317, 1855.

? *Exochus fulvipes* CRESSON, Proc. Ent. Soc. Phila., III, p. 285, 1864.—CRESSON, Syn. Hym. N. Am., p. 213, 1887.

? *Exochus curvator* DAVIS, Trans. Am. Ent. Soc., XXIV, p. 213, 1897.

From Popof Island, July 8.

Genus **Metacælus** Förster.**METACÆLUS LÆVIS** (Cresson).

Exochus lævis CRESSON, Proc. Ent. Soc. Phila., III, p. 286, 1864.—WALSH, Trans. St. Louis Acad. Sci., III, p. 93, 1873.—CRESSON, Syn. Hym. N. Am., p. 213, 1887.

Metacælus lævis DAVIS, Trans. Am. Ent. Soc., XXIV, p. 214, 1897.—ASHMEAD, Smith's Ins. New Jersey, p. 579, 1900.

Type in collection of the American Entomological Society. From Berg Bay, June 10; Popof Island, July 10, 12; Sitka, June 16; Virgin Bay, June 26; and Yakutat, June 26. A common species.

Subfamily *OPHIONINÆ*.Tribe *OPHIONINI*.Genus **Ophion** Gravenhorst.**OPHION BILINEATUM** Say.

Ophion bilineatus SAY, Maclurian Lyc. Arts and Sci., I, p. 75, 1828.—SAY, Journ. Boston Soc. Nat. Hist., I, p. 248, 1835.—LECONTE'S Ed. Say's Works, I, p. 378, 1855.—NORTON, Proc. Ent. Soc. Phila., I, p. 358, 1863.—PROVANCHER, Fn. du Can. Hym., p. 351, 1883.—CRESSON, Syn. Hym. N. Am., p. 200, 1887.—ASHMEAD, Smith's Ins. New Jersey, p. 580, 1900.

From Sitka, June 16. Two females.

Genus **Enicospilus** Curtis.**ENICOSPILUS PURGATUS** (Say).

Ophion purgatus SAY, Journ. Boston Soc. Nat. Hist., I, p. 239, 1835.—EMMONS, Nat. Hist. New York, v.—NORTON, Proc. Ent. Soc. Phila., I, p. 358, 1863.—PROVANCHER, Fn. du Can. Hym., p. 351, 1883.—CRESSON, Syn. Hym. N. Am., p. 200, 1887.

Ophion lateralis LEPELETIES, Hist. Natur. Hym., IV, p. 141, 1846.

Enicospilus purgatus ASHMEAD, Smith's Ins. New Jersey, p. 580, 1900.

From Fox Point, July 28. One female.

Tribe *ANOMALINI*.Genus **Atrometus** Förster.**ATROMETUS ALASKENSIS** sp. nov.

Female.—Length 11 mm. Reddish-brown; occiput, a large spot on vertex enclosing the ocelli, prosternum and sides of pronotum, mesosternum and a streak on the mesopleura beneath the wings, metasternum and the suture at base of the metanotum, the depression across base of mesoscutellum, the antennæ, except scape beneath, two last dorsal abdominal segments, and the hind legs, except the apex of the

first tarsal joint and joints 2, 3 and 4, black (rarely reddish-brown with tips of tibiæ fuscous or black as in male); orbits, face below antennæ, cheeks, mandibles, scape beneath, lemon-yellow; the apex of joint 1 and joints 2 to 4 of hind tarsi yellowish-white; palpi and tegulæ white; front and middle legs reddish-yellow; wings hyaline, iridescent, the costæ and internal veins brown, the stigma yellowish.

Male.—Agrees well with the female, except in the usual sexual differences in the antennæ and abdomen, and in having the hind legs, except the tips of tibiæ and the tarsal joints yellowish-white, not black but reddish-brown, while the front and middle coxæ and trochanters are yellowish-white.

A single male supposed to be a variety of this species, agrees fairly well with the normal form, except that the temples and the thorax, except the mesonotum and the scutellum are wholly black.

Type.—Cat. No. 5679, U. S. Nat. Museum. From Sitka, June 16; Muir Inlet, June 11; Virgin Bay, June 26; Yakutat, June 21; and Kukak Bay, July 4.

Tribe CAMPOPLIGINI.

Genus *Campoplex* Gravenhorst.

CAMPOPLEX LATICINCTUS Cresson.

Campoplex laticinctus CRESSON, Proc. Ent. Soc. Phila., iv, p. 283, ♀, 1865.

—PROVANCHER, Fn. du Can. Hym., p. 362, 1883.—CRESSON, Syn. Hym. N. Am., p. 202, 1887.

Campoplex nigripes PROVANCHER, Le Nat. Can., vi, p. 145, 1874.

Type in collection of the American Entomological Society. From Kukak Bay, July 4; Pribilof Islands, July 12; Virgin Bay, July 20.

A common species, found throughout the Northern States, New York, White mountains in New Hampshire, Maine, Colorado, Kansas and Canada.

Genus *Zachresta* Förster.

ZACHRESTA POPOFENSIS sp. nov.

Male.—Length 7.5 mm. Black, coriaceous, the depressions at sides of the prothorax and the disk of the mesopleura lineated; the mandibles and the legs, except the front and middle coxæ above, the hind coxæ entirely, first joint of their trochanters and the apex of the hind tibiæ and tarsi which are black, are red; the hind tibial spurs and annuli at base of tarsal joints 1 to 3 are, however, white; palpi and tegulæ yellowish-white. Wings hyaline, the stigma and veins brown-black; the areolet is petiolate, receiving the second recurrent nervure a little beyond its middle. Metathorax rather short, its posterior face

sharply oblique but with a small transverse quadrate basal area, the areola and petiolar areas being confluent and forming one large area; spiracles long-oval.

Type.—Cat. No. 5680, U. S. Nat. Museum. From Popof Island, July 10. One specimen.

ZACHRESTA KUKAKENSIS sp. nov.

Male.—Length 8 mm. Black, closely and distinctly punctate; mandibles ferruginous; palpi fuscous; tegulæ black; the legs, except a pale yellowish spot on front coxæ and trochanters, and the front femora beneath, their tibiæ entirely and the middle tibiæ, which are rufous, are black; the front and middle tarsi are dark fuscous, except narrowly at the sutures of the joints. Wings nearly hyaline, the stigma and veins dark brown, the areolet petiolate, receiving the second recurrent nervure at the middle. Metathorax very short, obliquely sloping off from immediately back of the scutellum, without a basal area and without carinæ, except the pleural carinæ below the spiracles; spiracles long-oval.

Type.—Cat. No. 5681, U. S. Nat. Museum. From Kukak Bay, July 4. One specimen.

Genus *Phædroctonus* Förster.

PHÆDROCTONUS MINUTUS sp. nov.

Female.—Length 3.5 mm. Black, opaque and very finely shagreened; scape and pedicel *beneath*, mandibles, palpi, tegulæ, front and middle coxæ and trochanters, the sutures and second joint of hind trochanters, an annulus at base of hind tibiæ and a broad band at their middle, and tibial spurs, yellowish-white; the hind legs otherwise black, the front and middle legs, except as noted, reddish-yellow; abdomen black, with the venter, hypopygium and the terminal dorsal segment, honey-yellow. Wings hyaline, the stigma and veins brown, the areolet entirely absent, the marginal cell being very broad, the first abscissa of the radius being nearly two thirds the length of the second.

Type.—Cat. No. 5682, U. S. Nat. Museum. From Popof Island, July 9. One specimen.

Genus *Olesicampa* Förster.

OLESICAMPA ALASKENSIS sp. nov.

Male.—Length 7 to 7.5 mm. Black, closely punctate, and clothed with a glittering white pubescence, that on the face rather dense. Scape beneath, two spots on clypeus nearly confluent anteriorly,

mandibles, tegulæ, front coxæ beneath and at apex, their trochanters, and the apex of the first joint and the second joint entirely of middle trochanters, pale yellowish or yellowish-white; palpi white; coxæ and first joint of middle and hind trochanters, except as noted, black; rest of legs rufous. Wings hyaline, the costæ blackish, the stigma and internal veins brown, the areolet small, very oblique and longly petiolate, the second recurrent nervure being interstitial with its apex. The abdomen is black, with the apex of the second dorsal segment, segments 3, 4 and 5 entirely, and the venter, except the last segment, rufous.

Type.—Cat. No. 5683, U. S. Nat. Museum. From Juneau, June 25. One specimen.

Genus **Hypothereutes** Förster.

HYPOTHEREUTES ANNULIPES sp. nov.

Female.—Length 7 mm.; ovipositor less than one third the length of the abdomen. Black, opaque, finely coriaceous; mandibles, prothoracic scale, and the legs, except tips of hind femora, their tibiæ and tarsi rufous, tips of hind femora, their tibiæ, except a broad median annulus or a long spot outwardly which is white, and tarsi black; palpi and tegulæ yellowish-white. Wings subhyaline, the stigma and veins brown-black, the areolet minute, petiolate. Metathorax incompletely areolated, the carinæ remaining poorly defined, but with the areola and petiolar area complete.

Type.—Cat. No. 5684, U. S. Nat. Museum. From Yakutat, July 21; Kukak Bay, July 4. Two specimens.

Genus **Ischnoscopus** Förster.

ISCHNOSCOPUS YAKUTATENSIS sp. nov.

Female.—Length 6.5 mm. Black, very finely, closely punctate, the metathorax completely areolated; mandibles and legs, except coxæ, rufous; palpi, tegulæ and epitegulæ yellowish-white; abdomen black, with the venter pale yellowish, dorsal segments 2 and 3 at apex rufous, the rufous on the third obliquely broadened laterally towards base, dorsal segment 4 and beyond, rufous at the sides. Wings hyaline, the stigma and veins brown-black, the areolet not small, subpetiolate, receiving the second recurrent nervure a little before its middle.

Male.—Length 6 mm. Agrees well with the female, except that dorsal abdominal segments 2 to 5 at apex are rufous, and the rufous along the sides of segments 3 to 5 extend clear to the base.

Type.—Cat. No. 5685, U. S. Nat. Museum. From Yakutat, June 21. Two specimens.

Genus **Limnerium** Ashmead.**LIMNERIUM YAKUTATENSE** sp. nov.

Female.—Length 6 mm. Black, finely opaquely shagreened, mandibles, labrum and legs, except coxæ and the first joint of hind trochanters, rufous; palpi and tegulæ yellowish, the epitegulæ white. Abdomen black, with the ventral segments more or less banded or spotted with white, the dorsal segments *laterally* more or less rufous or spotted with rufous, the third segment also with a rufous band at apex, usually narrowed medially and even sometimes interrupted medially. Wings hyaline, the stigma and veins brown black, the areolet rather large, petiolate receiving the second recurrent nervure before its middle.

Male.—Very similar to female except that the rufous spots on the sides of dorsal abdominal segments 3 and 4 are usually extended above and unite to form a band at apex of the segments; otherwise it is practically identical with the female.

Type.—Cat. No. 5686, U. S. Nat. Museum. From Yakutat, June 21. Many specimens.

This species, in color, imitates *Ischnoscopus yakutatensis* and could be easily confused with it.

Genus **Ameloctonus** Förster.**AMELOCTONUS POPOFENSIS** sp. nov.

Female.—Length 5 mm. Black, opaque, finely coriaceous; mandibles, palpi, tegulæ, epitegulæ, apices of front coxæ, their trochanters and the middle trochanters, yellowish-white; coxæ and first joint of hind trochanters black; extreme tips of hind tibiæ and their tarsi fuscous; remainder of legs ferruginous. Wings hyaline, the stigma and veins brown, the areolet sessile, receiving the second recurrent nervure beyond its middle. Metathorax areolated, the areola elongate, narrowed and open behind.

Type.—Cat. No. 5687, U. S. Nat. Museum. From Popof Island, July 10.

Tribe **PANISCINI**.Genus **Paniscus** Gravenhorst.**PANISCUS ALASKENSIS** sp. nov.

Male.—Length 10 mm. Head yellow, with purplish-brown eyes, and very much as in *Paniscus geminatus* Say, except that the ocelli are not placed on a black spot, and the lateral ocelli do not quite touch

the eye margin, as in that species. The thorax and abdomen are pale honey-yellow; a stripe on sides of prosternum, the lateral margins of the mesonotum, and a stripe on the parapsidal furrows behind, are yellowish-white; the apical transverse carina is indicated only laterally, being wholly obliterated medially, the surface of the metanotum before it being very finely, transversely aciculate, behind it polished and impunctate. Wings hyaline, the venation as in *P. geminatus*, the costal vein and the stigma yellow, the subcostal vein and the internal veins being brown or brown black. External claspers similar to those in *P. geminatus* but slightly narrower.

Type.—Cat. No. 5688, U. S. Nat. Museum. From Kukak Bay, July 4. Five specimens.

Tribe *MESOCHORINI*.

Genus *Mesochorus* Gravenhorst.

The three species belonging to this genus, found in Alaska, may be tabulated as follows:

1. Polished black.

All coxæ and legs pale yellowish or reddish-yellow.....2.

All coxæ mostly black, the front and middle coxæ usually pale at apex.

Legs honey-yellow, the apical two thirds of hind femora and the tips of their tibiæ fuscous; cheeks, clypeus anteriorly and the extreme apex of second dorsal segment of abdomen pale yellowish. Female.

K. kincaidi.

2. Face, clypeus, cheeks and lower part of temples yellowish-white.

Prothorax pale yellowish; abdomen black, with the apex of the second dorsal segment connected with a triangular median spot, a median line on the third and continued on to the fourth, pale yellowish.

Male.....*M. orca*.

Prothorax, except its sternum, black; abdomen black, with the venter and second dorsal suture white. Male.....*M. frontalis*.

MESOCHORUS KINCAIDI sp. nov.

Female.—Length 3 mm. Polished black; cheeks, anterior margin of the clypeus and the mandibles flavo-testaceous; pedicel and flagellum brown, the latter darker towards apex; palpi, tegulæ, ventral fold, the narrow membranous margins of dorsal abdominal segments 1 and 2, and the extreme apex of dorsal segment 2 yellowish-white; legs, except the middle and hind coxæ, apex of hind tibiæ, and tips of the joints of hind tarsi honey-yellow; middle and hind coxæ black, the

hind femora dusky, tips of hind tibiæ and tarsi fuscous. Wings hyaline, the stigma and veins brown. Antennæ 32-jointed, the first joint of the flagellum the longest, nearly as long as joints 2 and 3 united.

Type.—Cat. No. 5689, U. S. Nat. Museum. From Kukak Bay, July 4. One specimen.

MESOCHORUS ORCÆ sp. nov.

Male.—Length 4 mm. Polished black except as follows: The face below the antennæ, clypeus, cheeks, mandibles, scape and pedicel, prothorax, a band on the mesopleura *below*, front coxæ and trochanters, middle trochanters, ventral fold, the apex of the second dorsal abdominal segment connected with a triangular median spot and a median stripe on dorsal segments 3 and 4, pale yellowish or yellowish-white; legs, except as noted, reddish-yellow. Wings hyaline, the stigma yellowish-white, the costæ and internal veins brown.

Type.—Cat. No. 5690, U. S. Nat. Museum. From Orca, June 27. Two specimens.

MESOCHORUS FRONTALIS Ashmead.

Mesochorus frontalis ASHMEAD, Fur Seals and Fur Seal Isl., IV, p. 336, ♂, 1899.

Type.—Cat. No. 4037, U. S. Nat. Museum. From Bering Island (Mr. Barrett-Hamilton); Pribilof Islands (Fur Seal Commission).

Tribe PORIZONINI.

Genus *Isurgus* Förster.

ISURGUS ALASKENSIS sp. nov.

Female.—Length 2.8 mm.; ovipositor longer than the abdomen. Black; mandibles and legs, except the coxæ, more or less of the trochanters and the hind legs almost entirely, rufous; hind legs sometimes wholly rufous.

Head, except cheeks and temples, opaque, finely coriaceous; thorax, except the parapsidal furrows and a quadrate depressed space on the mesonotum posteriorly, which are coriaceous and opaque, shining, the metathorax short and shining, although feebly wrinkled, the apical transverse carina distinct and connected with two close parallel carinæ on the middle of the metanotum. Wings hyaline, the stigma and veins brown.

Abdomen longly petiolate, the body compressed, smooth and shining.

Type.—Cat. No. 5691, U. S. Nat. Museum. From Popof Island, July 9, 12. Two specimens.

Tribe *PLECTISCINI*.*Catastenus* Förster.

CATASTENUS ALASKENSIS sp. nov.

Female.—Length 3.5 to 4 mm.; ovipositor not longer than the petiole. Polished black, except the metathorax which is wrinkled and completely areolated, the first and second segments of the abdomen which are coriaceous and opaque and the third segment at base which is feebly sculptured; palpi yellowish; legs, except hind coxæ, rufous, the hind femora more or less dusky; abdomen with the apex of the second dorsal segment, the third entirely and the apex of the fourth, testaceous or yellowish; sometimes the apex of the fifth segment is yellowish.

The antennæ are 22-jointed, brown, and slightly and gradually thickened toward apex. Wings hyaline, the stigma and veins brown.

Male.—Agrees well with the female, except that the antennæ are 24-jointed, filiform and brown-black, the middle and hind coxæ are black, the hind femora brown-black, their tibiæ and tarsi subfuscous, while the abdomen has the apices of the segments yellow.

Type.—Cat. No. 5692, U. S. Nat. Museum. From St. Paul Island, July 10, 17.

CATASTENUS TRIFASCIATUS Ashmead.

Catastenus trifasciatus ASHMEAD, *Fur Seals and Fur Seal Isl.*, IV, p. 336, 1899.

Type.—Cat. No. 4038, U. S. Nat. Museum. From Bering Island (Dr. L. Stejneger); St. Paul Island (Fur Seal Commission).

Genus *Plectiscus* Gravenhorst.

PLECTISCUS ORCÆ sp. nov.

Female.—Length 3 mm. Polished black; clypeus, scape and pedicel beneath, the ring-joint, mandibles, palpi, tegulæ, prosternum, the lower margin of the prothorax, legs entirely, the ventral fold, and the apices of dorsal abdominal segments 2 and 3 and base of third narrowly, pale yellowish. Wings hyaline, the stigma and veins brown. Antennæ 21-jointed, the flagellum brown. Metathorax with a strong transverse carina and with lateral carinæ, the areola oblong-quadrangle. Abdomen, except the petiole and the second segment at base, highly polished, impunctate, the petiole more than thrice longer than thick, opaque and strongly coriaceous, the second segment at base feebly sculptured.

Type.—Cat. No. 5731, U. S. Nat. Museum. From Orca, June 27.
One specimen.

Family **ALYSIIDÆ**.

Subfamily **ALYSIINÆ**.

Tribe **ALYSIINI**.

Genus **Alysia** Latreille.

ALYSIA MANDUCATOR (Panzer).

- Ichneumon manducator* PANZER, Fn. Ins. Germ., VI, p. 72, Pl. 4, 1799.—
THUNBERG, Bull. Acad. Sc., St. Petersburg, VIII, 1822.—THUNBERG,
Mém. Acad. Sc., St. Petersburg, IX, p. 346, 1824.—CUVIER, Règne
animal. Ed. 3^a, Ins., II, Pl. 112, f. 9, 1849.
Bassus manducator PANZER, Krit. Rev., II, p. 75, 1806.—NEES, Mag. Ges.,
Berlin, p. 202, 1814.
Alysia stercoraria LATREILLE, Hist. Nat., XIII, p. 177, 1805.—LAMARCK,
Hist. Nat. Anim. s. vert. Ed., 2^a, IV, p. 357, 1835.
Bracon manducator JURINE, Nouv. Méth. Hym., p. 118, ♀, 1807.—TRENTÉ-
POHN, Isis, p. 960, 1829.
Cechenus manducator ILLIGER, in Rossi's Faun. Etrusca, Ed. 2^a, II, p. 54,
1807.—ILLIGER, Magaz. f. Insectenk., VI, p. 15, 1809.
Alysia manducator LATREILLE, Gen. Crust. et Ins., IV, p. 15, 1809.—LEPE-
LETIER, Encycl. Méth., X, p. 432, 1825.—CURTIS, Brit. Ent., III, p. 141,
1826.—BONCHÉ, Naturg. d. Forstins, p. 147, 1834.—HALIDAY, Ent.
Mag., I, p. 265, 1833; *idem*, V, p. 220, ♀ ♂, 1838, Pl. F, f. 1 and 28.—
ZETTERSTEDT, Ins. Lappon., I, p. 401, 1838.—BLANCHARD, Hist. Nat. Ins.,
III, p. 345, 1840.—WESTWOOD, Intro. Mod. Classif. Ins., II, Synop., p.
65, 1840.—CURTIS, Farm. Ins., p. 144.—GUÉRIN, Iconogr. règn. anim.,
p. 411, 1845.—RUTHE, Stettin. ent. Zeitg., XX, p. 319, 1859.—FÖRSTER,
Verh. naturh. Ver. preuss. Rheinl., XIX, p. 265, 1862.—VOLLENHOVEN,
Pinacogr., p. 23; Pl. 15, f. 2, ♀, f. 3, ♂, 1876.—MARSHALL, Trans. Ent.
Soc. London, p. 508; Pl. 11, f. 4, ♀, 1894.—MARSHALL, in André's
Spec. Hym. Eur., V, p. 376, 1894.—THOMSON, Opus. Ent. Fasc., 20, p.
2295, ♀ ♂, 1895.—DALLA TORRE, Cat. Hym., IV, p. 47, 1898.
Alysia fossulata PROVANCHER, Add. Fn. Hym., p. 391, ♀, 1888.—DALLA
TORRE, Cat. Hym., IV, p. 45, 1898.

From Belkofski, July 22.

This common European species is parasitic in the larvæ of various
Diptera. In Europe it has been bred from *Lucilia caesar* L., *Cyrtoneara stabulans* Fall., and *Hydrotæa dentipes* Fabr.

Genus **Anarcha** Förster.

ANARCHA COXALIS sp. nov.

Male.—Length 3 mm. Polished black; mandibles, except teeth,
scape beneath, and the legs, except coxæ, rufo-testaceous; front coxæ
basally and the middle and hind coxæ black; tips of hind tibiæ and
their tarsi subfuscous; palpi, ring-joint of antennæ and tegulæ pale
yellowish. Wings hyaline, the large stigma and the veins brown.
Antennæ very long, 42-jointed. Metathorax opaque, rugulose and

areolated. Abdomen, except the first segment, polished black impunctate, the first segment longitudinally striate.

Type.—Cat. No. 5693, U. S. Nat. Museum. From Sitka, June 16. One specimen.

Tribe *ALLÆINI*.

Genus *Delocarpa* Förster.

DELOCARPA SITKENSIS sp. nov.

Female.—Length 2 mm. Polished black, the first segment of the abdomen, and the second towards base reddish-brown; mandibles red; legs rufo-testaceous, the femora and hind tibiæ toward apex and their tarsi dusky. Antennæ 17-jointed, the scape and pedicel brown, the flagellum black, the joints delicately fluted; the first joint of the flagellum is obconical, about thrice as long as thick, the following to the ninth are oblong but imperceptibly become shorter and shorter, those beyond to the last being quadrate or nearly so, scarcely longer than thick. Wings hyaline, the long linear stigma and the internal veins being light brown or brownish-yellow. Metathorax rather coarsely rugulose. Abdomen polished, impunctate, except the first segment which is longitudinally striate.

Type.—Cat. No. 5694, U. S. Nat. Museum. From Sitka, June 16. One specimen.

Subfamily *DACNUSINÆ*.

Genus *Rhizarcha* Förster.

RHIZARCHA HARRINGTONI sp. nov.

Male.—Length 4 mm. Head and thorax black, shining; scape, pedicel, abdomen except petiole, and the legs brownish-yellow, the dorsal abdominal segments with a fuscous tinge at the sutures, the hind tarsi and sheaths of the ovipositor fuscous; palpi whitish. Wings hyaline, the narrow stigma and the veins brown. Antennæ about 40-jointed, the flagellum black, the joints cylindrical, clothed with a short, rather dense pubescence. Mesonotum with a long median grooved line posteriorly. Metathorax rugulose, clothed with a rather dense yellowish pubescence. Abdomen, except as noted, brownish-yellow, polished, impunctate, the first segment black, rugulose.

Type.—Cat. No. 5695, U. S. Nat. Museum. From Juneau, July 25. One specimen.

Genus *Gyrocampa* Förster.

GYROCAMPA ALASKENSIS sp. nov.

Female.—Length 2 mm.; ovipositor not longer than the first joint of hind tarsi. Polished black; mandibles red; tegulæ and legs, ex-

cept as noted, dark rufous, the middle and hind coxæ black or fuscous, the trochanters, base of tibiæ and tarsi honey-yellow. Wings hyaline, the linear stigma and the internal veins brown. Antennæ 24-jointed, the scape and pedicel black, the ring-joint yellow, the flagellum brown-black. The mesonotum has a median grooved line posteriorly just in front of the scutellum; the scutellum has a transverse crenate furrow across its base; the mesopleura have a crenate fovea on their disk; the metathorax is coarsely rugose and rather densely pubescent, while the abdomen, except the first segment which is finely rugulose and pubescent, is smooth and polished.

Type.—Cat. No. 5696, U. S. Nat. Museum. From St. Paul Island, August 22 (Fur Seal Commission).

Genus **Liposcia** Förster.

LIPOSCIA DUBIOSA sp. nov.

(Pl. XI, fig. 1.)

Male.—Length 1.5 mm. Polished black; mandibles reddish; palpi white; tegulæ and legs, except the hind tibiæ and tarsi, brownish-yellow; the hind tibiæ, except an annulus at base, and the tarsi fuscous. Wings hyaline, the very narrow lanceolate stigma and the veins being brown. Antennæ long, 27-jointed, black, with the scape beneath and an annulus at the base of the first joint of the flagellum yellow. Mesonotum with a short median grooved line posteriorly, the fovea at base of scutellum divided into two divisions by a delicate median carina, the mesopleura with a smooth discal fovea a little behind the middle, while the metathorax is feebly wrinkled posteriorly and at sides but smooth and shining at base above. Abdomen, except the first segment, smooth and shining, the first segment rugulose and carinate.

Type.—Cat. No. 5697, U. S. Nat. Museum. From Unalaska. One specimen.

Family **BRACONIDÆ**.

Subfamily **APHIDIINÆ**.

Genus **Praon** Haliday.

PRAON ALASKENSIS sp. nov.

(Pl. XI, fig. 3.)

Male.—Length 2 mm. Polished black; mandibles testaceous; palpi and annulus at base of flagellum, yellowish-white; legs rufo-testa-

ceous, the front coxæ and trochanters beneath yellowish, the middle coxæ basally and the hind coxæ blackish. Antennæ 25-jointed, longer than the body, the joints of the flagellum about thrice as long as thick. Thorax with distinct parapsidal furrows, the metathorax feebly alutaceous but shining, the pleural carinæ indistinctly defined, the median carina wanting, the spiracles small and round. Wings hyaline, the costal vein, basal nervure and parastigma piceous black, the stigma and internal veins brown. The abdomen, except the first segments, is smooth, shining and impunctate; the first segment is a little longer than wide, shorter than the second, finely rugulose, especially towards base, and has distinct lateral carinæ.

Type.—Cat. No. 5698, U. S. Nat. Museum. From St. Paul Island, August 16 (Fur Seal Commission). Two specimens.

Genus *Aphidius* Nees.

TABLE OF SPECIES.

1. Males.4.

2. Females.

Antennæ less than 19-jointed.....3.

Antennæ 19-jointed.

Head and thorax black; mandibles and tegulæ pale yellowish; legs brownish-yellow; abdomen rufo-piceous, polished, the petiole black, finely rugulose.....*A. glacialis*.

3. Antennæ 16-jointed, the last joint very long, as long as joints 14 and 15 united.

Black; abdomen with its tip and the second dorsal segment at apex yellowish; legs black or piceous black, the sutures of trochanters, extreme tips of femora, an annulus at base of tibiæ and mandibles, honey-yellow; antennæ black, the first joint of flagellum not quite as long as the second, joints 13 to 15 about $1\frac{1}{2}$ times as long as thick.

A. frigidus.

Antennæ 15-jointed, the last joint shorter than joints 13 and 14 united.

Black; abdomen with the second and third dorsal segments rufo-piceous (rarely wholly black); legs brownish-yellow or flavo-testaceous, the hind coxæ blackish; mandibles and first four joints of antennæ yellowish or testaceous; first five joints of flagellum elongate, nearly six times as long as thick; joint 14 not quite twice as long as thick.

A. paulensis.

4. Antennæ 21-jointed, or less.....5.
 Antennæ 22-jointed.

Black; abdomen with the second dorsal segment rufo-piceous at apex; mandibles rufo-piceous; palpi fuscous; metanotum smooth, without a median carina, the apical transverse carina alone present.

A. propinquus.

5. Antennæ 18-jointed.....6.
 Antennæ 21-jointed.

Black; mandibles reddish; palpi blackish; metanotum smooth but with a median carina; legs mostly black, with an annulus at base of tibiæ and their extreme apices usually honey-yellow or testaceous.

A. frigidus.

6. Black; abdomen with the apex of the petiole and sometimes more or less of the second segment rufo-testaceous, more yellowish in the sutures; femora and tibiæ above, and especially the middle hind pairs, fuscous, the coxæ black or rufo-piceous; metanotum short, with a diamond-shaped areola*A. paulensis.*

APHIDIUS PROPINQUUS sp. nov.

Male.—Length 3.3 mm. Polished black; mandibles reddish; palpi fuscous; legs, except a reddish piceous tinge at the sutures of joints, entirely black; abdomen, except a reddish or rufo-piceous band at apex of the second dorsal segment black. Antennæ 22-jointed, the joints of the flagellum delicately fluted and not more than twice longer than thick. Metanotum smooth with only the apical transverse carina present. Wings hyaline, veins brown, stigma yellowish or pale within.

Type.—Cat. No. 5699, U. S. Nat. Museum. From St. Paul Island, August 8, 20 (Fur Seal Commission). Two specimens.

APHIDIUS GLACIALIS sp. nov.

Female.—Length 2.8 mm. Head and thorax black, smooth and shining; abdomen, except the first segment dark rufous or rufo-piceous; mandibles, mouth parts, annulus at base of flagellum, tegulæ, and the front coxæ and trochanters, pale yellowish; remainder of legs brownish-yellow, the basal joint of the middle tarsi scarcely longer than joints 2 and 3 united, the basal joint of hind tarsi nearly as long as all the other joints united.

The antennæ are 19-jointed, black, shorter than the body, the third joint being about four times as long as thick. Abdomen rufo-piceous, smooth and shining, except the first segment which is black, finely rugulose and fully thrice as long as thick.

Type.—Cat. No. 5700, U. S. Nat. Museum. From Juneau, July 25. One specimen.

Proc. Wash. Acad. Sci., May, 1902.

APHIDIUS FRIGIDUS sp. nov.

(Pl. XI, fig. 4.)

Female.—Length 3.5 mm. Polished black; abdomen with its apex or the sutures of the two apical segments and the apex of the second dorsal segments testaceous or yellowish, or sometimes the second and third segments testaceous; mandibles, tips of palpal joints, sutures of trochanters, knees and an annulus at base of flagellum, honey-yellow or yellowish. Wings hyaline, the stigma pale within, the outer margins and the internal veins brown.

The antennæ are 16-jointed and hardly two thirds the length of the body, the first three joints of the flagellum are subequal, a little more than thrice longer than thick. Metathorax smooth and areolated, the median carina being distinct. Abdomen elongate lanceolate, compressed and pointed towards apex, smooth and polished, except the first segment which is finely rugulose, nearly four times as long as thick and with the spiracles placed before the middle.

Male.—Differs principally in having the antennæ 21-jointed, the joints of the flagellum being much shorter, the first three joints hardly thrice as long as thick, while the abdomen is shorter, compressed from the apex of the second segment and nearly always entirely black.

Type.—Cat. No. 5701, U. S. Nat. Museum. From St. Paul Island, August 8 to 20 (Fur Seal Commission). Many specimens.

APHIDIUS PAULENSIS sp. nov.

Female.—Length 1.6 to 2 mm. Polished black; mandibles reddish; palpi and tegulæ whitish; first four joints of the antennæ and the legs brownish-yellow. Wings hyaline, the stigma lanceolate, pallid, the outer and internal veins brownish.

The antennæ are 15-jointed, brown-black from the fifth joint; the first three joints are about four times as long as thick, the following to the last, shorter, the last joint being shorter than joints 13 and 14 united. Thorax with the parapsidal furrows incomplete, only vaguely defined anteriorly, the metathorax short with a diamond-shaped areola. Abdomen depressed, petiolated and terminating in a distinct ovipositor, which is longer than the basal joint of the hind tarsi; the petiole is more than thrice longer than thick and finely wrinkled.

Male.—Differs in having the antennæ 18-jointed, black, except an annulus at base of the third joint, and in having the legs, except the sutures of trochanters, and the femora and tibiæ especially of the front and middle legs, *beneath*, which are rufo-testaceous, all black.

Type.—Cat. No. 5702, U. S. Nat. Museum. From St. Paul Island, August 15 to 20 (Fur Seal Commission). Nine specimens.

Subfamily *HELCONINÆ*.

Tribe *DIOSPILINI*.

Genus *Dyscoletes* Westwood.

DYSCOLETES ALASKENSIS sp. nov.

Male.—Length 3.2 mm. Polished black; mandibles, except teeth, and the legs, except front coxæ and hind tibiæ and tarsi, pale ferruginous; palpi, tegulæ and front coxæ yellowish; hind tibiæ, except an annulus at base, and their tarsi fuscous, the tips of the tarsal joints yellowish. Wings hyaline, the stigma and veins brown.

The antennæ are 33-jointed, very long, much longer than the body and, except the scape beneath which is more or less piceous, black. Thorax with the parapsidal furrows distinct anteriorly and terminating in a finely punctate depression before the base of the scutellum; the metathorax is shining but finely wrinkled and tricarinate—a median and two lateral carinæ. The abdomen is subcompressed at apex, polished black, the ventral fold testaceous, the first segment feebly wrinkled, especially laterally beyond the spiracles, which are rather large and placed before the middle, and with a delicate median carina on its apical portion.

Type.—Cat. No. 5703, U. S. Nat. Museum. From Popof Island.

Subfamily *CHELONINÆ*.

Genus *Chelonus* Jurine.

CHELONUS IRIDESCENS Cresson.

Chelonus iridescens CRESSON, Proc. Ent. Soc. Phila., IV, p. 294, 1865.—PROVANCHER, Fn. du Can. Hym., p. 532, 1883.—CRESSON, Syn. Hym. N. Am., p. 225, 1887.

Type in collection of the American Entomological Society. From Kukak Bay, July 4. Two specimens. Occurs also in Canada, Colorado, New Mexico and elsewhere in the United States.

Subfamily *MICROGASTERINÆ*.

Genus *Protapanteles* Ashmead.

PROTAPANTELES ALASKENSIS sp. nov.

Male and Female.—Length 3 mm. Black, smooth and impunctate; mandibles rufous; palpi pale yellowish; legs, except coxæ and as here-

after noted, honey-yellow, the coxæ black, the apices of hind femora and their tarsi fuscous or subfuscous, the tibial spurs and the first joint of hind tarsi at base, yellowish-white. Wings hyaline, the stigma and veins except the subcostal, median and submedian veins basally, brown.

The abdomen, except the membranous lateral margins of the first dorsal segment and a large translucent or semitranslucent spot on the second ventral segment, is black and shining; the plate of the first segment is long, narrow, and slightly narrowed towards apex; the second segment is shorter than the third, has two oblique furrows and its surface is feebly alutaceous, especially along the furrows.

Male.—Differs from the female principally in the color of the legs. The hind femora, base of middle femora and the apical half of the hind tibiæ and their tarsi are fuscous; otherwise, except in the sexual abdominal differences, it is scarcely separable from the female.

Type.—Cat. No. 5704, U. S. Nat. Museum. From Virgin Bay, June 26; Farragut Bay, June 5; Yakutat, June 21.

PROTAPANTELES GLACIALIS sp. nov.

Male.—Length 2.1 mm. Black; face and thorax above very finely punctulate, sericeous; palpi beneath yellowish, above fuscous; legs mostly black, the front trochanters beneath, their femora beneath and at apex, their tibiæ wholly, and their tarsi beneath, apices of middle femora, bases of their tibiæ, and the knees of hind legs, honey-yellow, or testaceous. Wings hyaline, the stigma and stigmal vein brown, the internal and basal veins pallid. The abdomen, except the lateral membranous margins of segments 1 and 2 which are brown, is black and shining; the plate of the first segment is oblong, nearly the same width throughout, alutaceous and subopaque; while the second segment is shorter than the third, has two oblique furrows and is finely aciculate.

Type.—Cat. No. 5705, U. S. Nat. Museum. From Muir Inlet, June 12. One specimen.

PROTAPANTELES ALTICOLA sp. nov.

Male and Female.—Length 2.6 to 3 mm. Black; mandibles ferruginous; palpi yellowish; legs, except the hind coxæ and last joint of tarsi, ferruginous, the hind coxæ black, the last joint of tarsi fuscous; sometimes there is a dusky or fuscous streak on the middle and hind femora above. Wings hyaline, the tegulæ yellowish, the stigma and veins brown. Head and thorax smooth or nearly so, at most with some sparse, microscopic punctures, the face with a median ridge, the

metathorax alutaceous, without trace of carinae. The abdomen is much compressed towards apex, black and shining, with the lateral membranous margins of the first segment yellowish; the plate of the first segment is long, narrowed towards apex, fully thrice as long as wide at base; the second segment is shorter than the third, with two oblique furrows, the plate formed by the furrows being trapezoidal in outline and very delicately aciculate.

Male.—Differs from female in being longer and with longer antennae, in having the apical half of the hind tibiae and their tarsi fuscous, and in having the lateral margins of the first and second segments, and the third suture, yellowish.

Type.—Cat. No. 5706, U. S. Nat. Museum. From St. Paul Island, August 16 (Fur Seal Commission). Four specimens.

Genus **Apanteles** Förster.

APANTELES YAKUTATENSIS sp. nov.

Female.—Length 2.5 mm. Black; mandibles, except at base and the teeth, rufous; palpi yellowish; legs, except coxae, first joint of trochanters, apices of hind femora, and their tarsi ferruginous; coxae and first joint of trochanters black; apices of hind femora and their tarsi fuscous; middle and front tarsi above subfuscous. Wings hyaline, the stigma and apices of the costae dark brown, the internal veins paler, the costal veins toward base yellowish, the tegulae piceous black.

The head above is polished, impunctate, the face sparsely but distinctly punctate; thorax above, except a space laterally above and in front of the tegulae, closely punctate; the scutellum is smooth or nearly so; the mesopleura on disk above and beyond the median impression are smooth and highly polished but anteriorly and below the middle they are finely punctate; while the metathorax is rather coarsely rugose, the median carina being almost entirely obliterated. The abdomen, except the first and the second segments which are rugulose, is smooth and polished; the third dorsal segment is somewhat shorter than the second.

Type.—Cat. No. 5707, U. S. Nat. Museum. From Yakutat, June 21. Two specimens.

Genus **Microplitis** Förster.

MICROPLITIS ALASKENSIS sp. nov.

Female.—Length 3.6 mm. Black, closely punctate; palpi yellow, with the basal joints black; legs ferruginous, with all coxae and tro-

chanters black, except the second joint of trochanters, base of middle and hind femora, extreme apex of hind tibiæ and their tarsi; tegulæ piceous black. Wings hyaline, the costæ to near apex, a spot at base of stigma and most of the internal veins brownish-yellow, the apices of the costal veins, stigma and post-stigmal vein dark brown. Metathorax coarsely rugose, the pleural carinæ strongly elevated, the median carina distinct. The abdomen, except the first segment which is rugulose, and the second segment which is feebly alutaceous, with a broad median swelling, is smooth and polished.

Type.—Cat. No. 5708, U. S. Nat. Museum. From Juneau, July 25. One specimen.

Subfamily *ICHNEUTINÆ*.

Genus *Ichneutes* Nees.

ICHNEUTES REUNITOR Nees.

Ichneutes reunitor NEES, Mag. Ges. naturf. Fr. Berlin, VII, p. 276; Tom. 7, f. 5, 1813.—WESMAEL, Nouv. Mém. Acad. Sc. Bruxelles, XI, p. 156, 1838.—BLANCHARD, Hist. Nat. Inst., III, p. 335, 1840.—WESTWOOD, Intro. Mod. Class. Ins., II, Synop., p. 63, 1840.—RATZBURG, Ichn. d. Forstins., III, p. 69, 1852.—FÖRSTER, Verh. Naturh. Ver. pr. Rheinl. XIX, p. 255, 1862.—MARSHALL, Ent. Mo. Mag., XII, p. 195, 1876.—MARSHALL, Trans. Ent. Soc. London, p. 183, 1889.—MARSHALL, in André's Spec. Hym. Eur., V, p. 211, 1893.—THOMSON, Opus. Ent. Fasc., 20, p. 2214, 1895.—DALLA TORRE, Cat. Hym., IV, p. 88, 1898

From Popof Island, July 11. Two specimens.

Parasitic in the larvæ of saw-flies, belonging to the family Nematidæ, and is widely distributed over Europe from the Arctic Circle to the Mediterranean. Here first recorded from North America.

ICHNEUTES POPOFENSIS sp. nov.

Male.—Length 3 mm. Black, shining, and clothed with a sparse, glittering white pubescence; mandibles rufous, black basally; palpi and the legs, except the coxæ and the middle and hind trochanters which are black, pale ferruginous.

The antennæ are 27-jointed, as long as the body, slender toward tips, the third joint the longest, not quite as long as joints 4 and 5 united, joint 8 and joints beyond, a little more than twice longer than thick. Wings hyaline, the costæ, outer margins of parastigma and the stigma, brown black, the stigma within and the internal veins brownish-yellow; the first abscissa of the radius is hardly developed, not larger than the very short, second transverse cubitus, and leaving the second cubital cell subsessile. The metathorax is coarsely rugulose,

without an areola. The abdomen is elongate, the first segment long and narrowed towards base, shagreened, with a longitudinal median elevation, the dorsal carinæ only distinct basally, the second segment, except very feebly in the basal depressions, and the following segments being smooth and impunctate.

Type.—Cat. No. 5709, U. S. Nat. Museum. From Popof Island, July 9. One specimen.

ICHNEUTES ALASKENSIS sp. nov.

Male.—Length 4 mm. Resembles *I. popofensis* but the palpi are subfuscous, the antennæ shorter, 24-jointed, the legs darker, the middle femora basally, the hind femora, their tibiæ, except basally and beneath, and their tarsi being black or dark fuscous, the first abscissa of the radius is distinct, half the length of the first transverse cubitus, while the first and second abdominal segments are coarsely rugulose, the first segment being broad and having the dorsal carinæ distinct to at least the middle.

Type.—Cat. No. 5710, U. S. Nat. Museum. From Popof Island, July 11. One specimen.

Subfamily OPIINÆ.

Genus *Desmiostoma* Förster.

DESMIOSTOMA KUKAKENSE sp. nov.

Female.—Length 3 mm.; ovipositor very short, subexserted, the sheaths black. Polished black, impunctate; clypeus and mandibles rufous; palpi, pedicel narrowly at apex, tegulæ, and the legs, except the hind coxæ, pale brownish-yellow, the hind coxæ basally and posteriorly blackish. Wings hyaline, the lanceolate stigma and the veins light brownish.

The antennæ are longer than the body; the mesonotum has an elongate, median, crenate fovea posteriorly just in front of the scutellum, the parapsidal furrows not being defined except far anteriorly on the slope where they are deep and crenate; the scutellum has a transverse crenate furrow across its base; while the metathorax is rugulose without carinæ. Wings with the venation normal, the submedian cell longer than the median, the first recurrent nervure being almost interstitial with the first transverse cubitus, while the second cubital cell is elongate, the second abscissa of the radius being somewhat more than twice the length of the first. Abdomen long oval,

smooth and impunctate, except the first segment which is longitudinally striate.

Male.—Differs from female in having the antennæ longer, a faint median carina on the metathorax and in having the hind coxæ yellow, not black.

Type.—Cat. No. 5711, U. S. Nat. Museum. From Kukak Bay, July 4; Seldovia, July 21.

Subfamily *BRACONINÆ*.

Tribe *BRACONINI*.

Genus *Macrodyctium* Ashmead.

MACRODYCTIUM POLITUM sp. nov.

Female.—Length 3 mm.; ovipositor scarcely one third the length of the abdomen. Polished black, impunctate, except the second abdominal segment which has some longitudinal aciculations at its basal middle; mandibles rufous; palpi fuscous; second joint of trochanters, apical third of front femora and their tibiæ, and the middle and hind tibiæ basally honey-yellow. Wings hyaline, the stigma and veins brown, the tegulæ black.

Type.—Cat. No. 5712, U. S. Nat. Museum. From Kukak Bay, July 4. One specimen.

Subfamily *RHOGADINÆ*.

Tribe *EXOTHECUS*.

Genus *Exothecus* Wesmael.

EXOTHECUS ALASKENSIS sp. nov.

Female.—Length 2 mm.; ovipositor less than half the length of the abdomen. Polished black, impunctate, except the collar and the metathorax which are finely rugulose, opaque, and the first segment of abdomen which is longitudinally striate; remainder of abdomen smooth and shining, black, except dorsal segments 2 and 3 which, in certain lights, have a rufopiceous tinge; the palpi and a minute annulus at base of first joint of the flagellum are white or yellowish-white; tegulæ and legs brownish-yellow. Wings hyaline, the stigma lanceolate, pallid within, its outer margins and the internal veins being light brownish.

Type.—Cat. No. 5713, U. S. Nat. Museum. From Popof Island, July 10.

Tribe *RHOGADINII*.Genus *Rhogas* Nees.*RHOGAS HARRIMANI* sp. nov.

Male.—Length 7 mm. Black; an annulus at base of first joint of flagellum, the second dorsal abdominal segment, except narrowly at apex, and the legs, except the apices of hind femora, apical third of their tibiae and their tarsi, ferruginous; palpi yellowish.

The antennae are longer than the body; the first joint of the flagellum is the longest, the following joints subequal, all being longer than thick. The head and thorax are finely coriaceous and also punctate, the transverse depression on the pronotum with short elevated lineations, the parapsidal furrows distinct, the mesopleura with a large shining spot at the middle and posteriorly, the metathorax rugulose with distinct pleural and median carinae, while the metapleura, except at margins, are highly polished. The abdomen is fully as long as the head and the thorax united, with dorsal segments 1 and 2 and base of 3, rugulose, the remainder of the third and the following segments being smooth and shining; segments 1 and 2 have also a longitudinal carina down the center. Wings hyaline, or at most only faintly tinged, the costal veins at apex and the stigma being brown-black, the internal veins light brown, the parastigma and costal and median veins toward their base being yellow; the second cubital cell is oblong and fully twice as long as the first abscissa of the radius, while the submedian cell is very much longer than the median.

Type.—Cat. No. 5714, U. S. Nat. Museum. From Fox Point, July 8. One specimen.

Suborder II. *PHYTOPHAGA* Latreille.Superfamily IX. *SIRICOIDEA* Ashmead.Family *SIRICIDÆ*.Genus *Sirex* Linné.*SIREX FLAVICORNIS* Fabricius.

Sirex flavicornis FABRICIUS, Spec. Insect., I, p. 418, 1781.—FABRICIUS, Mant. Insect., I, p. 257, 1787.—GMELIN, Linné, Syst. Nat. Ed. 13^a, I, p. 2672, 1790.—FABRICIUS, Ent. Syst., II, p. 126, 1793.—FABRICIUS, Syst. Piez., p. 49, 1804.—DALLA TORRE, Cat. Hym., I, p. 385, 1894.—KONOW, Wien. ent. Zeitg., XVII, pp. 75–76, 1898.

Tremex flavicornis LEPELETIER, Encycl. Méth. Ins., x, p. 228, 1825.

Urocerus flavicornis PROVANCHER, Nat. Canad., x, p. 228, 1878.—PROVANCHER, Fn. ent. du Can. Hym., p. 239, 1883.—CRESSON, Syn. Hym. N. Am., p. 173, 1887.—HARRINGTON, Tr. Roy. Soc. Canada, pp. 138, 146, 1893.

From Yukon River; Nushagak River, August 14, 1882 (McKay); Wrangell (H. F. Wickham). This species is widely distributed over British Columbia, Canada and the United States. A single specimen was taken at Kluchefski, Kamchatka, in 1897, by Dr. L. Stejneger.

Superfamily X. TENTHREDINOIDEA Ashmead.

Family LYDIDÆ.

Genus *Itycorsia* Konow.

ITYCORSIA MARGINIVENTRIS (Cresson).

- Lyda marginiventris* CRESSON, Trans. Am. Ent. Soc., VIII, p. 29, 1880.—
CRESSON, Syn. Hym. N. Am., p. 170, 1887.
Pamphilus marginiventris KIRBY, List Hym. Brit. Mus., I, p. 345, 1882.—
DALLA TORRE, Cat. Hym., I, p. 433, 1894.
Lyda credita KINCAID, Proc. Wash. Acad. Sci., II, p. 344, 1900.

Type in collection of the American Entomological Society. From Sitka.

Genus *Cephaleia* Jurine.

CEPHALEIA NIGROPECTA (Cresson).

- Lyda nigropectus* CRESSON, Trans. Am. Ent. Soc., VIII, p. 32, 1880.—CRESSON,
Syn. Hym. N. Am., p. 171, 1887.
Pamphilus nigropectus KIRBY, List Hym., Brit. Mus., I, p. 347, 1882.—
DALLA TORRE, Cat. Hym., I, p. 435, 1894.
?Canonydus nigropectus KONOW, An. K. K. Hofmus. Wien., XII, p. 254, 1897.
Cephaleia nigropectus KINCAID, Proc. Wash. Acad. Sci., II, p. 344, 1900.

Type in collection of the American Entomological Society. From Sitka.

Genus *Bactroceros* Konow.

BACTROCEROS SITKENSIS Kincaid.

- Bactroceros sitkensis* KINCAID, Proc. Wash. Acad. Sci., II, p. 344, 1900.

Type.—Cat. No. 5280, U. S. Nat. Museum. From Sitka.

BACTROCEROS PALACHEI sp. nov.

- Cephaleia* sp. KINCAID, Proc. Wash. Acad. Sci., II, p. 344, 1900.

Female.—Length 11 mm. Head rufous with a blackish spot on middle of vertex enclosing the ocelli and extending as a narrow line back to the occiput; antennæ broken off after the third joint, the three joints remaining rufous; the clypeus, the cheeks, the mandibles, a short line along the inner margins of the lateral lobes of vertex, a broader line extending from summit of eyes backwards to the occiput, and a short line below it just back of the eyes, yellowish-white; su-

tures of gula black; palpi whitish with the last two joints of the maxillary palpi fuscous. Thorax black, with a spot at apex of scutellum, the upper hind angles of prothorax, the tegulæ, and a spot just in front of the insertion of front coxæ, yellowish-white; legs, except the extreme base of coxæ which is black, and the apex of the hind tibiæ and more or less of their tarsi which are reddish, ivory-white. Wings hyaline, with a very faint indistinct fuscous band across the disk below the stigma, the stigma, the costal, intercostal, lower branch of the subcostal, median and anal veins, yellow, rest of the veins brown. Abdomen reddish, with the first two segments, except medially, and the terminal ventral segment blackish.

Type.—Cat. No. 5741, U. S. Nat. Museum. From Kodiak, July 5 (C. Palache, collector).

Family SELANDRIIDÆ.

Subfamily BLENNOCAMPINÆ.

Genus *Fenusa* Leach.

FENUSA ALASKANA Kincaid.

Fenusa alaskana KINCAID, Proc. Wash. Acad. Sci., II, p. 345, 1900.

Type.—Cat. No. 5281, U. S. Nat. Museum. From Kukak Bay.

Genus *Erythraspides* Ashmead.

ERYTHRASPIDES ASHMEADII Kincaid.

Erythraspides ashmeadii KINCAID, Proc. Wash. Acad. Sci., II, p. 346, 1900.

Type.—Cat. No. 5282, U. S. Nat. Museum. From Sitka.

Genus *Monophadnus* Hartig.

MONOPHADNUS INSULARIS Kincaid.

Monophadnus insularis KINCAID, Proc. Wash. Acad. Sci., II, p. 346, 1900.

Type.—Cat. No. 5283, U. S. Nat. Museum. From Metlakatla.

Subfamily SELANDRIINÆ.

Paraselandria Ashmead.

PARASELANDRIA RUFIGASTRA Kincaid.

Paraselandria rufigastria KINCAID, Proc. Wash. Acad. Sci., II, p. 346, 1900.

Type.—Cat. No. 5284, U. S. Nat. Museum. From Kukak Bay.

Genus *Pæcilostomidea* Ashmead.

PÆCILOSTOMIDEA MACULATA (Norton).

- Harpiphorus maculatus* NORTON, Proc. Boston Soc. Nat. Hist., VIII, p. 157, 1861.—PROVANCHER, Add. Fn. Can. Hym., p. 348, 1888.—HARRINGTON, Ins. Life, II, pp. 227-228, 1890.
- Emphytus maculatus* RILEY, Prairie Farmer, May, 1867.—NORTON, Trans. Am. Ent. Soc., I, p. 232, 1867.—RILEY, Am. Ent., I, pp. 90-91, fig. 76, 1869.—NORTON, Trans. Am. Ent. Soc., IV, p. 80, 1872.—SAUNDERS, Fourth Rep. Ontario Ent. Soc., p. 18, 1873-74.—RILEY, Ninth Rep. Ins. Missouri, pp. 28-29, fig. 10, 1877.—THOMAS, Seventh Rep. Ins. Illinois, p. 111, 1877-78.—PROVANCHER, Nat. Can., X, p. 69, 1878.—FULLER, Amer. Entom., III, p. 109, fig. 36, 1880.—PROVANCHER, Fn. ent. du Can. Hym., p. 195, 1883.—THOMAS, Tenth Rep. Ins. Illinois, p. 68, 1883-84.—FORBES, Fourteenth Rep. Ins. Illinois, p. 77, 1884-85. CRESSON, Syn. Hym. N. Am., p. 160, 1887.
- Pæcilostomidea maculatus* ASHMEAD, Smith's Ins. New Jersey, p. 606, 1900.—KINCAID, Proc. Wash. Acad. Sci., II, p. 346, 1900.
- From Sitka, Yakutat, Virgin Bay.

Family NEMATIDÆ.

Subfamily NEMATINÆ.

Genus *Pachynematus* Konow.

PACHYNEMATUS OCREATUS (Harrington).

- Nematus ocreatus* HARRINGTON, Can. Ent., XXI, p. 25, 1889.
- Pachynematus ocreatus* MARLATT, Techn. Ser., No. 3, U. S. Dept. Agric., p. 95, 1896.—KINCAID, Proc. Wash. Acad. Sci., II, p. 347, 1900.
- Co-type*.—Cat. No. 3488, U. S. Nat. Museum. From Sitka.

PACHYNEMATUS AFFINIS Marlatt.

- Pachynematus affinis* MARLATT, Techn. Ser., No. 3, U. S. Dept. Agric., p. 97, ♀♂, 1896.—KINCAID, Proc. Wash. Acad. Sci., II, p. 347, 1900.
- Type*.—Cat. No. 1943, U. S. Nat. Museum. From Popof Island.

PACHYNEMATUS ORONUS Kincaid.

- Pachynematus oronus* KINCAID, Proc. Wash. Acad. Sci., II, p. 347, 1900.
- Type*.—Cat. No. 5285, U. S. Nat. Museum. From Yakutat Bay.

PACHYNEMATUS PLEURICUS (Norton).

- Nematus pleuricus* NORTON, Trans. Am. Ent. Soc., I, p. 208, ♀, 1867.—CRESSON, Syn. Hym. N. Am., p. 159, 1887.—DALLA TORRE, Cat. Hym., I, p. 251, 1894.
- Pachynematus pleuricus* MARLATT, Techn. Ser., No. 3, U. S. Dept. Agric., p. 100, 1896.—KINCAID, Proc. Wash. Acad. Sci., II, p. 348, 1900.

Type.—Cat. No. 5286, U. S. Nat. Museum (male). From Kukak Bay.

PACHYNEMATUS ORARIUS Kincaid.

Pachynematus orarius KINCAID, Proc. Wash. Acad. Sci., II, p. 348, ♀, 1900.

Type.—Cat. No. 5287, U. S. Nat. Museum. From Kukak Bay; Sitka.

PACHYNEMATUS GOTARUS Kincaid.

Pachynematus gotarus KINCAID, Proc. Wash. Acad. Sci., II, p. 348, ♂, 1900.

Type.—Cat. No. 5288, U. S. Nat. Museum. From Popof Island.

Genus **Nematus** Jurine.

NEMATUS LONGICORNIS Eschscholtz.

Nematus longicornis ESCHSCHOLTZ, Entomogr., p. 95, 1822.—ESCHSCHOLTZ, Naturw. Abh. Dorpat, I, p. 149, 1843.—NORTON, Trans. Am. Ent. Soc., I, p. 202, 1867.—CRESSON, Syn. Hym. N. Am., p. 158, 1887.—DALLA TORRE, Cat. Hym., II, p. 235, 1894.

From Unalaska.

NEMATUS CRASSUS Eschscholtz.

Nematus crassus ESCHSCHOLTZ, Entomogr., p. 93, 1822.—ESCHSCHOLTZ, Naturw. Abh. Dorpat, I, p. 149, 1825.—NORTON, Trans. Am. Ent. Soc., I, p. 213, 1867.—CRESSON, Syn. Hym. N. Am., p. 158, 1887.

From Unalaska.

Genus **Pristiphora** Latreille.

PRISTIPHORA ORTINGA Kincaid.

Pristiphora ortinga KINCAID, Proc. Wash. Acad. Sci., II, p. 349, ♀, 1900.

Type.—Cat. No. 5290, U. S. Nat. Museum. From Kukak Bay.

PRISTIPHORA ANAKA Kincaid.

Pristiphora anaka KINCAID, Proc. Wash. Acad. Sci., II, p. 350, ♀, 1900.

Type.—Cat. No. 5291, U. S. Nat. Museum. From Kukak Bay.

PRESTIPHORA CIRCULARIS Kincaid.

Prestiphora circularis KINCAID, Proc. Wash. Acad. Sci., II, p. 350, ♀, 1900.

Type.—Cat. No. 5292, U. S. Nat. Museum. From Popof Island.

PRISTIPHORA BUCODA Kincaid.

Pristiphora bucoda KINCAID, Proc. Wash. Acad. Sci., II, p. 350, ♀, 1900.

Type.—Cat. No. 5289, U. S. Nat. Museum. From Berg Bay; Sitka.

PRISTIPHORA KØEBELEI Marlatt.

Pristiphora kœbelei MARLATT, Bull. No. 3, Tech. Ser. U. S. Dept. Agric., p. 119, ♀, 1896.—KINCAID, Proc. Wash. Acad. Sci., II, p. 351, 1900.

Type.—Cat. No. 1960, U. S. Nat. Museum. From State of Washington; Alaska; Kukak Bay.

PRISTIPHORA LENA Kincaid.

Pristiphora lena KINCAID, Proc. Wash. Acad. Sci., II, p. 351, ♂, 1900.

Type.—Cat. No. 5293, U. S. Nat. Museum. From Sitka.

Genus **Euura** Newman.

EUURA INSULARIS Kincaid.

Euura insularis KINCAID, Proc. Wash. Acad. Sci., II, p. 352, ♀♂, 1900.

Type.—Cat. No. 5302, U. S. Nat. Museum. From Popof Island.

Genus **Pontania** Costa.

PONTANIA TUNDRA Kincaid.

Pontania tundra KINCAID, Proc. Wash. Acad. Sci., II, p. 352, ♀♂, 1900.

Type.—Cat. No. 5296, U. S. Nat. Museum. From Popof Island.

PONTANIA POPOFIANA Kincaid.

Pontania popofiana KINCAID, Proc. Wash. Acad. Sci., p. 353, ♀♂, 1900.

Type.—Cat. No. 5294, U. S. Nat. Museum. From Popof Island.

PONTANIA UNGA Kincaid.

Pontania unga KINCAID, Proc. Wash. Acad. Sci., II, p. 354, ♀, 1900.

Type.—Cat. No. 5298, U. S. Nat. Museum. From Popof Island.

PONTANIA ORA Kincaid.

Pontania ora KINCAID, Proc. Wash. Acad. Sci., II, p. 354, ♀, 1900.

Type.—Cat. No. 5297, U. S. Nat. Museum. From Popof Island.

PONTANIA PENINSULARIS Kincaid.

Pontania peninsularis KINCAID, Proc. Wash. Acad. Sci., II, p. 354, ♀, 1900.

Type.—Cat. No. 5301, U. S. Nat. Museum. From Kukak Bay.

PONTANIA ISLANDICA Kincaid.

Pontania islandica KINCAID, Proc. Wash. Acad. Sci., II, p. 355, ♀, 1900.

Type.—Cat. No. 5299, U. S. Nat. Museum. From Popof Island.

PONTANIA GLINKA Kincaid.

Pontania glinka KINCAID, Proc. Wash. Acad. Sci., II, p. 355, ♀♂, 1900.

Type.—Cat. No. 5295, U. S. Nat. Museum. From Popof Island.

PONTANIA KUKAKIANA Kincaid.

Pontania kukakiana KINCAID, Proc. Wash. Acad. Sci., II, p. 356, ♀, 1900.

Type.—Cat. No. 5300, U. S. Nat. Museum. From Kukak Bay.

Genus **Pteronus** Jurine.

PTERONUS SHUMAGENSIS Kincaid.

Pteronus shumagensis KINCAID, Proc. Wash. Acad. Sci., II, p. 357, ♀, 1900.

Type.—Cat. No. 5303, U. S. Nat. Museum. From Popof Island.

PTERONUS ZEBRATUS Kincaid.

Pteronus zebratus KINCAID, Proc. Wash. Acad. Sci., II, p. 357, ♀, 1900.

Type.—Cat. No. 5305, U. S. Nat. Museum. From Yakutat.

PTERONUS RIVULARIS Kincaid.

Pteronus rivularis KINCAID, Proc. Wash. Acad. Sci., II, p. 358, ♂, 1900.

Type.—Cat. No. 5304, U. S. Nat. Museum. From Sitka.

Genus **Amauronematus** Konow.

AMAURONEMATUS ISOLATUS Kincaid.

Amauronematus isolatus KINCAID, Proc. Wash. Acad. Sci., II, p. 358, ♀, 1900.

Type.—Cat. No. 5306, U. S. Nat. Museum. From St. Paul Island.

Family **TENTHREDINIDÆ**.Subfamily **DOLERINÆ**.Genus **Dolerus** Jurine.

DOLERUS APRILIS (Norton).

Dosytheus aprilis NORTON, Proc. Boston Soc. Nat. Hist., VIII, p. 151, ♀♂, 1861.—CRESSON, Proc. Ent. Soc. Phila., IV, p. 243, 1865.—NORTON, Trans. Am. Ent. Soc., I, p. 236, 1867.—PROVANCHER, Nat. Canad., X, p. 71, 1878.—PROVANCHER, Fn. ent. du Can. Hym., p. 197, 1883.—CRESSON, Syn. Hym. N. Am., p. 161, 1887.—DALLA TORRE, Cat. Hym., I, p. 3, 1894.—ASHMEAD, Smith's Ins. New Jersey, p. 609, 1900.—KINCAID, Proc. Wash. Acad. Sci., II, p. 359, 1900.

From Orca, Virgin Bay, Yakutat, Kukak Bay.

DOLERUS ELDERI Kincaid.

Dolerus elderi KINCAID, Proc. Wash. Acad. Sci., II, p. 359, ♀♂, 1900.

Type.—Cat. No. 5307, U. S. Nat. Museum. From Popof Island, Kukak Bay.

DOLERUS SERICEUS Say.

Dolerus sericeus SAY, Keatings Narrat. Exp., II, App., p. 320, ♀♂, 1824.—LECONTE, Ed. Say., II, p. 214, 1859.—NORTON, Proc. Boston Soc. Nat. Hist., VIII, p. 154, 1861.—PROVANCHER, Natur. Canad., x, p. 71, 1878.—PROVANCHER, Fn. ent. du Can. Hym., p. 197, 1883.—CRESSON, Syn. Hym. N. Am., p. 161, 1887.—DALLA TORRE, Cat. Hym., I, p. 17, 1894.—ARTEMAN, Smith's Ins. New Jersey, p. 609, 1900.—KINCAID, Proc. Wash. Acad. Sci., II, p. 359, 1900.

From Yakutat, Berg Bay, Sitka, Virgin Bay, Kodiak.

DOLERUS SIMILIS (Norton).

Dosytheus similis NORTON, Proc. Boston Soc. Nat. Hist., VIII, p. 153, ♀, 1861.—NORTON, Trans. Amer. Ent. Soc., I, p. 238, 1867.—PROVANCHER, Nat. Can., x, p. 72, 1878.—PROVANCHER, Fn. ent. du Can. Hym., p. 198, 1883.—CRESSON, Syn. Hym. N. Am., p. 161, 1887.—DALLA TORRE, Cat. Hym., I, p. 171, 1894.—ASHMEAD, Smith's Ins. New Jersey, p. 609, 1900.

From Yukon River.

Subfamily *STRONGYLOGASTERINÆ*.Genus *Emphytus* Klug.*EMPHYTUS ANGUSTUS* Kincaid.

Emphytus angustus KINCAID, Proc. Wash. Acad. Sci., II, p. 360, ♂, 1900.

Type.—Cat. No. 5308, U. S. Nat. Museum. From Kukak Bay.

Subfamily *TENTHREDININÆ*.Genus *Pachyprotasis* Hartig.*PACHYPROTASIS NIGROFASCIATA* (Eschscholtz).

Tenthredo nigrofasciata ESCHSCHOLTZ, Entomogr., p. 96, 1822.—ESCHSCHOLTZ, Naturw. Abh. Dorpat, I, p. 148, 1823.—NORTON, Trans. Am. Ent. Soc., II, p. 241, 1869.—CRESSON, Syn. Hym. N. Am., p. 168, 1887.

Emphytus? nigrofasciatus KIRBY, List Hym. Brit. Mus., I, p. 204, 1882.—DALLA TORRE, Cat. Hym., I, p. 119, 1894.

Macrophya (Pachyprotasis) omega NORTON, Trans. Am. Ent. Soc., I, p. 280, ♀♂, 1867.

Pachyprotasis omega PROVANCHER, Nat. Can., x, p. 108, 1878.—PROVANCHER, Fn. ent. du Can. Hym., p. 210, 1883.—CRESSON, Syn. Hym. N. Am., p. 166, 1887.—DALLA TORRE, Cat. Hym., I, p. 43, 1894.

Pachyprotasis nigrofasciata KINCAID, Proc. Wash. Acad. Sci., II, p. 360, 1900.

From Unalaska, Popof Island, Unga, Virgin Bay.

Genus **Macrophya** Dahlbom.**MACROPHYA OREGONA** Cresson.

Macrophya oregona CRESSON, Trans. Am. Ent. Soc., VIII, p. 19, ♀, 1880.—
CRESSON, Syn. Hym. N. Am., p. 166, 1887.—DALLA TORRE, Cat. Hym.,
I, p. 55, 1894.—KINCAID, Proc. Wash. Acad. Sci., II, p. 361, 1900.

Type in collection of the American Entomological Society. From
Seldovia.

Genus **Tenthredo** Linné.**TENTHREDO AURARIA** Konow.

Tenthredo auraria KONOW, Ent. Nachr., xxv, p. 154, ♀, 1899.

From Wrangell.

TENTHREDO FERRUGINEIPES Cresson.

Tenthredo ferrugineipes CRESSON, Trans. Am. Ent. Soc., VIII, p. 22, ♀, 1880.
—CRESSON, Syn. Hym. N. Am., p. 168, 1887.—DALLA TORRE, Cat.
Hym., I, p. 91, 1894.—KINCAID, Proc. Wash. Acad. Sci., II, p. 361,
♀♂, 1900.

Type in collection of the American Entomological Society. From
Sitka, Virgin Bay, Seldovia, Kodiak, Kukak Bay, Popof Island.

TENTHREDO VARIPICTA Norton.

Tenthredo varipicta NORTON, Trans. Am. Ent. Soc., II, p. 234, ♀, 1868.—
CRESSON, Syn. Hym. N. Am., p. 169, 1887.—DALLA TORRE, Cat.
Hym., I, p. 106, 1894.—KINCAID, Proc. Wash. Acad. Sci. II, p. 361, 1900.

Type in collection of the American Entomological Society. From
Fox Point, Berg Bay, Sitka, Yakutat, Seldovia, Kodiak, Kukak Bay,
Popof Island.

TENTHREDO EVANSII (Harrington).

Tenthredopsis Evansii HARRINGTON, Can. Ent., XXI, p. 98, 1889.—DALLA
TORRE, Cat. Hym., I, p. 30, 1894.

Tenthredo Evansii KINCAID, Proc. Wash. Acad. Sci., II, p. 362, ♀♂, 1900.

Type in collection of W. H. Harrington, Ottawa, Canada. From
Sitka, Yakutat, Kodiak, Virgin Bay.

TENTHREDO LINEATA Provancher.

Tenthredo lineata PROVANCHER, Natural. Can., x, p. 198, ♀, 1878.—CRES-
SON, Trans. Am. Ent. Soc., VIII, p. 43, 1880.—PROVANCHER, Fn. ent.
Can. Hym., p. 224, 1883.—CRESSON, Syn. Hym. N. Am., p. 168,
1887.—DALLA TORRE, Cat. Hym., I, p. 95, 1894.—ASHMEAD, Smith's
Ins. New Jersey, p. 612, 1900.—KINCAID, Proc. Wash. Acad. Sci., II,
p. 362, 1900.

Type in Parliament Building, Quebec, Canada. From Sitka, Virgin
Bay, Gustavus Point, Seldovia.

Proc. Wash. Acad. Sci., May, 1902.

TENTHREDO FLAVOMARGINIS (Norton).

Allantus flavomarginis NORTON, Journ. Boston Soc. Nat. Hist., VII, p. 254, ♀, 1860.

Tenthredo flavomarginis NORTON, Trans. Am. Ent. Soc., II, p. 238, 1869.—CRESSON, Syn. Hym. N. Am., p. 168, 1887.—DALLA TORRE, Cat. Hym., I, p. 93, 1894.—ASHMEAD, Smith's Ins. New Jersey, p. 611, 1900.—KINCAID, Proc. Wash. Acad. Sci., II, p. 362, 1900.

Type in collection of the American Entomological Society. From Berg Bay, Yakutat, Seldovia.

TENTHREDO NIGRICOLLIS Kirby.

Tenthredo nigricollis KIRBY, List Hym. Brit. Mus., I, p. 308, ♀, pl. 12, f. 3, 1882.—CRESSON, Syn. Hym. N. Am., p. 168, 1887.—DALLA TORRE, Cat. Hym., I, p. 99, 1894.—KINCAID, Proc. Wash. Acad. Sci., II, p. 362, 1900.

? *Tenthredo semicomis* HARRINGTON, Can. Ent., XXI, p. 98, ♂, 1889.—DALLA TORRE, Cat. Hym., I, p. 104, 1894.

Type in British Museum. From Sitka, Seldovia, Kukak Bay.

TENTHREDO ERYTHROMERA Provancher.

Tenthredo erythromera PROVANCHER, Add. Fn. du Can. Hym., p. 13, ♀, 1885.—CRESSON, Syn. Hym. N. Am., p. 168, 1887.—DALLA TORRE, Cat. Hym., I, p. 90, 1894.—KINCAID, Proc. Wash. Acad. Sci., II, p. 363, 1900.

Type in Parliament Building, Quebec, Canada. From Sitka, Metlakatla, Muir Inlet, Seldovia, Kukak Bay, Yakutat, Kodiak.

TENTHREDO MELANOSOMA Harrington.

Tenthredo melanosoma HARRINGTON, Can. Ent., XXVI, p. 194, ♀, 1894.—KINCAID, Proc. Wash. Acad. Sci., II, p. 363, 1900.

Type in collection of W. H. Harrington, Ottawa, Canada. From Wrangell, Sitka, Seldovia, Yakutat, Kodiak.

TENTHREDO HARRIMANI Kincaid.

Tenthredo harrimani KINCAID, Proc. Wash. Acad. Sci., II, p. 363, ♀, 1900.

Type.—Cat. No. 5310, U. S. Nat. Museum. From Popof Island.

TENTHREDO DISSIMULANS Kincaid.

Tenthredo dissimulans KINCAID, Proc. Wash. Acad. Sci., II, p. 363, ♀♂, 1900.

Type.—Cat. No. 5312, U. S. Nat. Museum. From Popof Island, Kukak Bay.

TENTHREDO BIVITTATA Kincaid.

Tenthredo bivittata KINCAID, Proc. Wash. Acad. Sci., II, p. 364, ♀, 1900.

Type.—Cat. No. 5311, U. S. Nat. Museum. From Popof Island.

Genus *Allantus* Jurine.

ALLANTUS HERACLEI Kincaid.

Allantus heraclei KINCAID, Proc. Wash. Acad. Sci., II, p. 364, 1900.

Type.—Cat. No. 5309, U. S. Nat. Museum. From Popof Island.

Family CIMBICIDÆ.

Subfamily CIMBICINÆ.

Genus *Cimbex* Olivier.

CIMBEX AMERICANA Leach.

Tenthredo femorata ABBOT (*nec* Linné), Drawings Ins. of Georgia, XII, pl. 61, ♀, 1792.

Cimbex Americana LEACH, Zool. Miscell., III, p. 104, ♂, 1817.—LEPELETIER, Monogr. Tenthred., p. 33, 1823.—HARRIS, Treat. Ins. Inj. Veg. Mass., p. 374, 1841.—NORTON, Proc. Ent. Soc. Phila., I, pp. 201–202, 1862.—NORTON, Trans. Am. Ent. Soc., I, p. 40, ♀♂, 1867.—PROVANCHER, Natural Can., x, p. 16, f. 2, 1878.—PROVANCHER, Fn. ent. du Can. Hym., p. 177, f. 28, 1883.—RILEY, Rep. Agri. Dept., pp. 334–336, pl. 5, f. 1^{a-k}, 1884.—MINOT, Arch. Mikr. Anat., XVIII, p. 37 ff., pl. 7, 1886.—CRESSON, Syn. Hym. N. Am., p. 177, 1887.—WEBSTER, Ins. Life, II, pp. 228–230, f. 45, 1890.—PACKARD, Rep. U. S. Ent. Comm., v, p. 584, f. 194, 1890.—TOWNSEND, Can. Ent., XXIV, p. 126, 1892.—ALDRICH, Can. Ent., XXIV, p. 144, 1892.—DALLA TORRE, Cat. Hym., I, p. 369, 1894.—KINCAID, Proc. Wash. Acad. Sci., II, p. 365, 1900.

From Kodiak.

Genus *Trichiosoma* Leach.

TRICHIOSOMA TRIANGULUM Kirby.

Trichiosoma triangulum KIRBY, Faun. Bor. Amer., IV, p. 254, 1837.—NORTON, Proc. Ent. Soc. Phila., III, p. 5, 1864.—NORTON, Trans. Am. Ent. Soc., I, p. 43, ♀♂, 1867.—BETHUNE, Can. Ent., VIII, p. 158, 1875.—PROVANCHER, Natural Can., x, p. 17, 1878.—PROVANCHER, Fn. ent. du Can. Hym., p. 177, 1883.—CRESSON, Syn. Hym. N. Am., p. 156, 1887.—DALLA TORRE, Cat. Hym., I, p. 365, 1894.—ASHMEAD, Smith's Ins. New Jersey, p. 612, 1900.

Type in British Museum. From Nushagak River (Chas. W. McKay).

TRICHIOSOMA ALEUTIANUM Cresson.

Trichiosoma aleutianum CRESSON, Trans. Am. Ent. Soc., VIII, p. I, ♀, 1880.—*Trichiosoma triangulum* var. *aleutianum* CRESSON, Syn. Hym. N. Am., p. 156, 1887.—DALLA TORRE, Cat. Hym., I, p. 366, 1894.—KINCAID, Proc. Wash. Acad. Sci., II, p. 365, 1900.

Type in collection of the American Entomological Society. From Aleutian Islands, Kukak Bay, Kodiak, Popof Island.

PLATE IX.

- FIG. 1. *Psithyrus kodiakensis* Ashm. ♂.
2. *Tetrarhapta alaskensis* Ashm. ♀.
3. *Terobia vulgaris* Ashm. ♀.
4. *Automalus nigropilosus* Ashm. ♂.
5. *Exolytus clypeatus* Ashm. ♀.
6. *Plectocryptus yakutatensis* Ashm. ♀.

The black hair-line at the side or beneath the figures represents the natural length of the specimen.

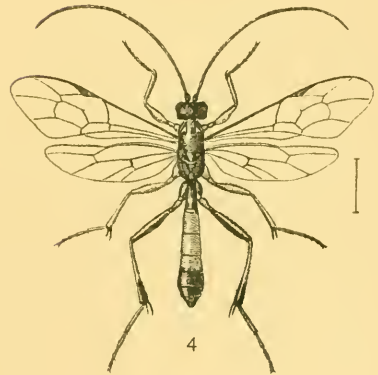
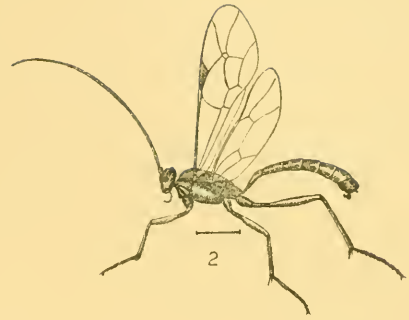


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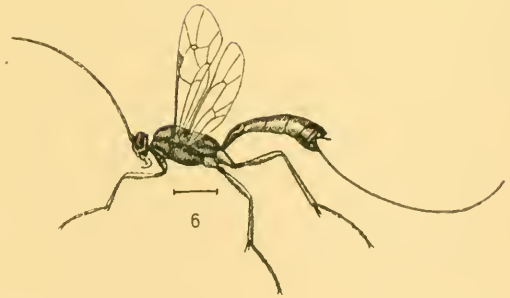
PLATE X.

- FIG. 1. *Bathymetis simillima* Ashm. ♂.
2. *Harrimaniella yakutatensis* Ashm. ♂
3. *Trevoria yakutatensis* Ashm.
4. *Hyposyntactus flavifrons* Ashm. ♂.
5. *Dallatorrea armata* Ashm. ♂.
6. *Pimplopterus alaskensis* Ashm. ♀.



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PLATE XI.

- FIG. 1. *Liposcia dubiosa* Ashm. ♂.
2. *Synoplus brevipennis* Ashm. ♀.
3. *Praon alaskensis* Ashm. ♂.
4. *Aphidius frigidus* Ashm. ♀.



L L Howenstein, del.

Не. іаути 14, Вочка.

ALASKA HYMENOPTERA.

INDEX

NOTE.—New genera and species in **black face** type.

- Aclastus* Förster 187
 rufipes 187
Aclista Förster 139
 californica Ashm. 139
Acrolyta Förster 186
 aciculata 186
 karlukensis 186
Ænoplex Förster 188
 rufipes 188
Algina Förster 188
 alaskensis 188
Allantus Jurine 263
 heraclei Kincaid 263
Allæini, Tribe 242
Allotriinæ, Subfam. 142
Alloxysta Förster 142
 alaskensis 142
Alysia Latreille 241
 manducator Panzer 241
Alysiidæ, Fam. 241
Alysiini, Tribe 241
Amauronematus Konow 259
 isolatus Kincaid 259
Ameloctonus Förster 237
 popofensis 237
Anarcha Förster 241
 coxalis 241
Andrena Latreille 131
 frigida Smith 131
Andrenidæ, Fam. 131
Anomalini, Tribe 233
Apanteles Förster 249
 yakutatensis 249
Aphidiinæ, Subfam. 243
Aphidius Nees 244
 frigidus 246
 glacialis 245
 paulensis 246
 propinquus 245
Apoidea, Superfam. I 123
Arachnophila Ashmead 134
 septentrionalis Kincaid 134
Asynocrita Förster 163
 species 163
Atmetus Förster 231
 insularis Ashmead 231
Atractodes Gravenhorst 169
 yakutatensis 169
Atrometus Förster 233
 alaskensis 233
Automalus Wesmæel 148
 nigropilosus 148
Bachia Förster 185
 nigra Ashmead 185
Bactroceros Konow 254
 palachei 254
 sitkensis Kincaid 254
Bassini, Tribe 224
Bassus Gravenhorst 224
 pulchripes Provancher 224
Bathymetis Förster 173
 bicolor 182
 confusa 180
 imitator 177
 nigricornis 177
 quadriceps 181
 rubrocincta 178
 simillima 179
 simulans 178
 simulator 181
 ungæ 180
Belytidæ, Fam. 137
Bioblapsis Förster 224
 tricincta 224
Blennocampinæ, Subfam. 255
Blepharipus Lepeletier 132
 ater Cresson 132
Bombidæ, Fam. 123
Bombus Latreille 123
 alaskensis 128
 californicus Smith 124
 couperi Cresson 126
 dimidiatus 129
 frigidus Smith 126
 gelidus Cresson 127
 juxtus Cresson 127
 kincaidii Cockerell 127
 mckayi 125
 melanopygus Nylander 128
 mixtuosus 128
 moderatus Cresson 123
 nearcticus Handlirsch 127
 neglectulus 124
 nevadensis Cresson 124
 oregonensis Cresson 126
 pleuralis Nylander 127
 polaris Curtis 127
 proximus Cresson 124
 prunellæ Cockerell 129

- Bombus Latreille—continued
 sitkensis Nylander 126
 sylvicola Kirby 127
 Braconidæ, Fam. 243
 Braconinæ, Subfam. 252
 Braconini, Tribe 252

 Calliphhrurus Förster 218
 affinis 221
 alaskensis 220
 clypeatus 220
 confusus 223
 frigidus 222
 glacialis 222
 kukakensis 222
 minor 221
 perplexus 222
 popofensis 221
 Camaratops Förster 232
 kodiakensis 232
 Campoplex Gravenhorst 234
 laticinctus Cresson 234
 Campopligini, Tribe 234
 Catastenus Förster 240
 alaskensis 240
 trifasciatus Ashmead 240
 Centeterus Wesmæel 161
 dorsator 161
 Cephaleia Jurine 254
 nigropecta Cresson 254
 Ceraphronidæ, Fam. 140
 Chalcidoidea, Superfam. VII 143
 Cheloninæ, Subfam. 247
 Chelonus Jurine 247
 iridescens Cresson 247
 Chrysidæ, Fam. 135
 Cimbex Olivier 263
 americana Leach 263
 Cimbicidæ, Fam. 263
 Clytochrysus Morawitz 132
 gracillissimus Packard 132
 Cosmoconus Förster 215
 canadensis Provancher 215
 Crabronidæ, Fam. 131
 Crabroninæ, Subfam. 131
 Cratichneumon Thomson 156
 alaskensis 157
 confusus 158
 kodiakensis 157
 popofensis 159
 yakutatensis 157
 Cryptinæ, Subfam. 162
 Cryptini, Tribe 193
 Cryptoideus Ashmead 193
 sitkensis 193
 Cteniscini, Tribe 210
 Cteniscus Haliday 210
 clypeatus Cresson 211
 nigrofemorals 211
 Ctenopelmini, Tribe 212
 Cubocephalus Ratzeburg 202
 alaskensis 203

 Cubocephalus Ratzeburg—continued
 atrocoxalis 203
 nigricornis 203
 Cynipoidea, Superfam. VI 141

 Dacnusinæ, Subfam. 242
 Dallatorrea 205
 armata 205
 Deleter Förster 229
 flavifrons 229
 kincaidi 229
 Delocarpa Förster 242
 sitkensis 242
 Desmlostoma Förster 251
 kukakense 251
 Diaborus Förster 212
 citrifrons 212
 sexmaculatus 212
 Diapriidæ, Fam. 140
 Diospilini, Tribe 247
 Dolerinæ, Subfam. 259
 Dolerus Jurine 259
 aprilis Norton 259
 elderi Kincaid 260
 sericeus Say 260
 similis Norton 260
 Dolichocrabro Ashmead 133
 wickhami 133
 Dyscoletes Westwood 247
 alaskensis 247

 Echthrodoca Schmiedeknecht 199
 clypearia 199
 gelida Cresson 199
 Eclytus Holmgren 204
 yakutatensis 204
 Ectemnius Dahlbom 131
 parvulus Packard 131
 Elachistinæ, Subfam. 147
 Elachistus Spinola 147
 glacialis 147
 Emphytus Klug 260
 angustus Kincaid 260
 Enicospilus Curtis 233
 purgatus Say 233
 Enizemum Förster 226
 tibiale Cresson 226
 Epiurus Förster 200
 atrocoxalis 201
 bicoloripes 201
 Eriplatys Förster 162
 sitkensis 162
 Erromenus Holmgren 212
 annulipes 212
 Erythrastides Ashmead 255
 ashmeadii Kincaid 255
 Eucæla Westwood 142
 alaskensis 142
 Eucælinæ, Subfam. 141
 Eulophidæ, Fam. 146
 Eulophinæ, Subfam. 147
 Eulophus Geoffroy 147

- Eulophus* Geoffroy—continued
 kukakensis 147
Eumenidæ, Fam. 134
Eutelus Walker 145
 confusus 145
Euura Newman 258
 insularis Kincaid 258
Exochini, Tribe 232
Exolytus Holmgren 163
 alaskensis 167
 clypeatus 168
 insularis 168
 kincaidi 167
 niger Ashmead 166
 perplexus 165
 popofensis 166
 rubrocinctus 169
 sanctipauli 166
 seldoviæ 168
 ungæ 167
 ungensis 169
Exothecus Wesmæel 252
 alaskensis 252

Fenusa Leach 255
 alaskana Kincaid 255
Figitidæ, Fam. 141
Formica Linné 136
 neorufibarbis Emery 136
Formicidæ, Fam. 136
Formicoidea, Superfam. IV 135

Gausocentrus Förster 206
Gemophaga Förster 223
 rufa 223
Glypta Gravenhorst 201
 kukakensis 201
 popofensis 201
Gyrocampa Förster 242
 alaskensis 242

Habromma Förster 188
 nigrum 188
Harrimaniella Ashmead 198
 kukakensis 198
Hedylus Förster 185
 crassicornis Ashmead 185
 species 185
Helconinæ, Subfam. 247
Hemitelini, Tribe 186
Himertosoma Schmiedeknecht 194
 schmiedeknechti 194
Holcostizus Förster 202
 yukonensis Ashmead 202
Homotropus Förster 226
 alaskensis 226
Hypocryptus Förster 206
 kodiakensis 208
 popofensis 208
 seldoviæ 209
 tibialis 209
 variegatipes 208

Hypoleptus Förster 227
 alaskens s 227
 glacialis 228
Hyposyntactus 217
 flavifrons 217
Hypotherutes Förster 236
 annulipes 236

Ichneumon Linné 149
 brevipennis Say 155
 cervulus 153
 glacialis 154
 imitator 151
 kincaidi 152
 kodiakensis 153
 popofensis 154
 simulator 153
 sitkensis 152
 wilsoni Cresson 155
Ichneumonidæ, Fam. 148
Ichneumonini, Tribe 148
Ichneumonoidea Superfam. VIII 148
Ichneutes Nees 250
 alaskensis 251
 popofensis 250
 reunitor Nees 250
Ichneutinæ, Subfam. 250
Ilapinastes Förster 190
 incertus 190
Ischnoscopus Förster 236
 yakutatensis 236
Isochresta Förster 190
 unicincta 190
Isurgus Förster 239
 alaskensis 239
Itycorsia Konow 254
 marginiventris Cresson 254

Joppini, Tribe 148

Lampronota Haliday 195
 lugubris Cresson 195
Lasius Fabricius 136
 niger Linné 136
Leptothorax Mayr. 135
 yankee kincaidi 135
Limnerium Ashmead 237
 yakutatense 237
Liposcia Förster 243
 dubiosa 243
Lissonota Gravenhorst 197
 alaskensis 197
 ruficoxis Schmiedeknecht 197
Lissonotini, Tribe 194
Lyda 254
 marginiventris Cresson 254
 nigropectus Cresson 254
Lydidæ, Fam. 254
Lygocerus Förster 140
 alaskensis 140

Macrodyctium Ashmead 252

- Macrodyctium Ashmead—continued
 politum 252
 Macrophyta Dahlbom 261
 oregona Cresson 261
 Megaspilinæ, Subfam. 140
 Melanichneumon Thomson 155
 seldoviae 155
 Mesochorini, Tribe 238
 Mesochorus Gravenhorst 238
 frontalis Ashmead 239
 kincaidi 238
 orca 239
 Mesoleius Holmgren 223
 aleutianus Cresson 224
 stejnegeri Ashmead 223
 Mesoleptini, Tribe 204
 Mesoleptus Gravenhorst 210
 unalaska 210
 Metacælus Förster 233
 laevis Cresson 233
 Microcryptus Thomson 184
 alaskensis 184
 trifasciatus 184
 Microgasterinæ, Subfam. 247
 Microplectron Förster 210
 alaskensis 210
 Microplitis Förster 249
 alaskensis 249
 Mimesa Shuckard 133
 propinqua Kincaid 133
 Miscogasteridæ, Fam. 144
 Monoblastus Hartig 213
 niger 213
 Monophadnus Hartig 255
 insularis Kincaid 255
 Myrmica Latreille 135
 laevinoides Nylander 135
 sabuleti lobifrons 135
 sulcinoides Emery 135
 Myrmicidæ, Fam. 135

 Nematidæ, Fam. 256
 Nematinae, Subfam. 256
 Nematus Jurine 257
 crassus Eschscholtz 257
 longicornis Eschscholtz 257
 Neuroteles Ratzeburg 228
 dubiosus 228

 Odontomerus Gravenhorst 202
 mellipes Say 202
 Odynerus Latreille 134
 albophaleratus Saussure 134
 Olesicampa Förster 235
 alaskensis 235
 Omalus Panzer 135
 sinuosus Say 135
 Ophion Gravenhorst 233
 bilineatum Say 233
 Ophioninæ, Subfam. 233
 Ophionini, Tribe 233
 Opiinæ, Subfam. 251

 Orthocentrini, Tribe 226
 Orthocentrus Gravenhorst 231
 nigritus 231

 Pachynematus Konow 256
 affinis Marlatt 256
 gotarus Kincaid 257
 ocreatus Harrington 256
 orarius Kincaid 257
 oronus Kincaid 256
 pleuricus Norton 256
 Pachyprotasis Hartig 260
 nigrofasciata Eschscholtz 260
 Paniscini, Tribe 237
 Paniscus Gravenhorst 237
 alaskensis 237
 Paraselandria Ashmead 255
 rufigastra Kincaid 255
 Passalæcus Shuckard 133
 cuspidatus Smith 133
 Pemphredonidæ, Fam. 133
 Pezomachini, Tribe 190
 Pezomachus Gravenhorst 192
 alaskensis Ashmead 193
 nigrellus 192
 obesus 193
 Phædroctonus Förster 235
 minutus 235
 Phænosemus Förster 231
 sitkensis 231
 Phæogenini, Tribe 161
 Philonygus Förster 189
 alaskensis 189
 glacialis 189
 Phthorina Förster 225
 borealis 225
 Phygadeuonini, Tribe 170
 Phytodietus Gravenhorst 195
 clypearius 195
 flavifrons 196
 Phytophaga, Suborder 253
 Pimpla Fabricius 200
 yakutatensis 200
 Pimplinæ, Subfam. 194
 Pimplini, Tribe 199
 Pimplopterus Ashmead 197
 alaskensis 198
 yakutatensis 197
 Platylabus Wesmæl 160
 californicus Cresson 161
 incabus Davis 160
 Plectiscini, Tribe 240
 Plectiscus Gravenhorst 240
 orca 240
 Plectrocryptus Thomson 182
 popofensis 183
 yakutatensis 183
 Plesiognathus Förster 184
 rubrocinctus 184
 Pæcilstomidea Ashmead 256
 maculata Norton 256
 Polyblastus Förster 213

- Polyblastus Förster—continued
 glacialis 213
 Polyterus Förster 217
 sexcarinatus 217
 Pompilidæ, Fam. 134
 Pompilinæ, Subfam. 134
 Pontania Costa 258
 glinka Kincaid 259
 islandica Kincaid 258
 kukakiana Kincaid 259
 ora Kincaid 258
 peninsularis Kincaid 258
 popofiana Kincaid 258
 tundra Kincaid 258
 unga Kincaid 258
 Porizonini, Tribe 239
 Praon Haliday 243
 alaskensis 243
 Pristiphora Latreille 257
 anaka Kincaid 257
 bucoda Kincaid 257
 circularis Kincaid 257
 kæbele Marlatt 258
 lena Kincaid 258
 ortinga Kincaid 257
 Probolus Wesmæel 160
 subdentatus 160
 Proctotrypes Latreille 136
 nigripes 136
 Proctotrypoidea, Superfam. V 136
 Promethes Förster 224
 unicinctus 224
 Protapanteles Ashmead 247
 alaskensis 247
 alticola 248
 glacialis 248
 Psithyridæ, Fam. 130
 Psithyrus Lepeletier 130
 insularis Smith 130
 kodiakensis 130
 Pteromalidæ, Fam. 145
 Pteronus Jurine 259
 rivularis Kincaid 259
 shumagensis Kincaid 259
 zebratus Kincaid 259
 Rhizarcha Förster 242
 harringtoni 242
 Rhogadinæ, Subfam. 252
 Rhogas Nees 252
 harrimani 252
 Rhyssa Holmgren 199
 alaskensis 199
 Scorpiorus Förster 214
 alaskensis 214
 niveicola 214
 Selandriidæ, Fam. 255
 Selandriinæ, Subfam. 255
 Sirex Linné 253
 flavicornis Fabr. 253
 Siricoidea, Superfam. IX 253
 Spanoctecnus Förster 204
 flavopictus 204
 Sphecoidea, Superfam. II 131
 Spilomicrus Westwood 140
 alaskensis 140
 Spinolia Förster 186
 minuta 186
 Stenichneumon Thomson 148
 unalaskæ 148
 Stenomærus Förster 232
 borealis 232
 Stibeutes Förster 170
 nigrita Ashmead 170
 Stiboscopus Förster 170
 alaskensis 171
 ferrugineus 173
 mandibularis 172
 sanctipauli 171
 sitkensis 172
 solitarius 172
 Stilpnini, Tribe 162
 Strongylogasterinæ, Subfam. 260
 Sychnoportus Förster 216
 longitarsis 216
 Synoplus Förster 226
 brevipennis 226
 pleuralis 226
 Tapinops Förster 230
 californicus Ashmead 230
 Tenthredinidæ, Fam. 259
 Tenthredininæ, Subfam. 260
 Tenthredinoidea, Superfam. X 254
 Tenthredo Linné 261
 auraria Konow 261
 bivittata Kincaid 262
 dissimulans Kincaid 262
 erythromera Provancher 262
 evansii Harrington 261
 ferrugineipes Cresson 261
 flavomarginis Norton 262
 harrimani Kincaid 262
 lineata Provancher 261
 melanosoma Harrington 262
 nigricollis Kirby 262
 varipicta Norton 261
 Terobia Förster 144
 vulgaris 144
 Tetrarhapta Förster 141
 alaskensis 141
 Tetrastichinæ, Subfam. 146
 Tetrastichus Haliday 146
 alaskensis 146
 anthracinus 146
 Thaumatotypus Förster 190
 alaskensis Ashmead 190
 Theroscopus Förster 191
 kukakensis 191
 popofensis 192
 rufipes 191
 Thestis Förster 187

Thestis Förster—continued
 tricincta 187
 Thyreopinæ, Subfam. 132
 Thyreopus Latreille 132
 vicinus Cresson 132
 Tlemon Förster 216
 delicatus 216
 Torymidæ, Fam. 143
 Torymus Dalman 143
 cecidomyiæ Walker 143
 Trematopygus Holmgren 215
 kukakensis 215
 Trevorina Ashmead 196
 yakutatensis 196
 Trichiosoma Leach 263
 aleutianum Cresson 263
 triangulum Leach 263
 Triclistus Förster 232
 curvator Fabricius 232
 Tridyminæ, Subfam. 144
 Trophoctonus Förster 215
 insularis 215
 Tryphon Gravenhorst 215
 alaskensis 215
 Tryphoninæ, Subfam. 204

Tryphonini, Tribe 215
 Vespa Linné 134
 borealis Kirby 134
 marginata Kirby 134
 Vespidae, Fam. 134
 Vespoidea, Superfam. III 134

 Xestophya Förster 162
 nigripes 163
 polita 162
 Xoridini, Tribe 202
 Xylonomus Gravenhorst 204
 frigidus Cresson 204

 Zachresta Förster 234
 kukakensis 235
 popofensis 234
 Zelotypa Förster 137
 alaskensis 139
 borealis 138
 scutellata 137
 Zootrephes Förster 225
 insularis 225
 Zygota Förster 139
 americana Ashmead 139

PROCEEDINGS
OF THE
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VOL. IV, PP. 275-292. [PLATE XII.]

JUNE 20, 1902.

PAPERS FROM THE HOPKINS STANFORD GALA-
PAGOS EXPEDITION, 1898-1899.

VIII.

BRACHYURA AND MACRURA.

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THIS collection though small is full of interest, yielding nine new species, one of which is the type of a new genus and family. Of the remainder more than half are additions to the fauna of the Galapagos Islands.

Suborder BRACHYURA.

Family OCYPODIDÆ.

Ocypode gaudichaudii Milne Edwards and Lucas.

Ocypode gaudichaudii MILNE EDWARDS and LUCAS, d'Orbigny's Voy. l'Amér.
Méréd., vi, pt. 1, p. 26, 1843; ix, pl. xi, f. 4, 1847.

Black Bight, Albemarle Island, January 9, 1 male, 1 female.

Distribution.—Gulf of Fonseca to Valparaiso; Chatham Island, Galapagos (*Albatross*).

UCA GALAPAGENSIS sp. nov.

[(Pl. XII, figs. 1 and 2.)]

Carapace very convex in both the antero-posterior and transverse directions; H-shaped dorsal suture very shallow; sulcus behind the

Proc. Wash. Acad. Sci., June, 1902.

(275)

orbit deeper; surface very finely granulate, and with small punctae rather distant from one another. Front very broadly rounded, its width at base exceeding one third the distance between the anterior angles, and also exceeding the width of the eyebrow, or surface between the orbit and the anterior margin of the carapace. Antero-lateral angles blunt, almost a right angle; the width between them being slightly less than the width of the carapace a little behind that point. Carapace broad behind, as compared with other species of the genus.

Larger cheliped with merus and carpus elongate, outer surface rugose, inner margin tuberculous. Palm with outer surface densely tuberculous, the tubercles coarse above, diminishing from above downwards; surface bent over superiorly to almost a horizontal position, and with a sulcus subparallel to the superior margin. This margin is marked by a raised line of tubercles. The inner surface of the palm has a very prominent oblique ridge extending from the lower margin upward and backward to a point above the middle, then turning distally until it joins a curved ridge which originates at the upper margin near the carpus; the oblique ridge is marked by a line of tubercles. A double row of depressed tubercles at the base of the dactylus. Space between this row and the oblique ridge in part finely granulous. Pollex almost straight; its prehensile tubercles in general increasing in size distally. Dactylus strongly curved, reaching when closed, beyond and below the pollex; only an occasional tubercle equaling those of the pollex. Outer surface of fingers finely granulate.

Ambulatory legs with meral joints of first three pairs dilated, those of the third pair about two and a half times as long as wide, those of the last pair with subparallel margins. Remaining joints slender. Legs long-hairy.

Dimensions.—Male, length 13.6 mm., anterior width 19.5, greatest width 19.8, width between posterior pair of legs 10, greatest posterior width (inferior) 16.5, length of propodus of large cheliped 35, length of dactylus 24.9, width of propodus 12.

Type Locality.—Indefatigable Island, Galapagos, April 12, 1888, U. S. Fish Commission steamer *Albatross*, 6 males (U. S. Nat. Museum Cat. No. 22319).

Additional Localities.—Nine small specimens, 6 male and 3 female, were taken by the Hopkins Stanford Expedition at South Seymour Island, near Indefatigable Island. James Island, April 11, 1888, 1 male, *Albatross*.

This species is readily distinguished by the very convex and smooth appearance of the carapace, the great width of the front, the character

of the inner surface of the palm in the male, and in full-grown specimens the sulcus on the upper surface of the palm.

UCA HELLERI sp. nov.

(Pl. XII, figs. 3 and 4.)

A small species. Carapace moderately convex, depressions shallow. Surface microscopically granulate, and with more distant punctæ. Front broad, but at base less than one third the width between the anterior angles; broadly rounded. Anterior margin sloping very abruptly backward from the front to the antero-lateral angles, scarcely sinuous. Antero-lateral angles prominent, rectangular; width of carapace greatest at these angles. Sides sloping strongly toward each other posteriorly; moderately sinuous, the posterior width about two thirds of the anterior. The eyebrow is for the most part visible from above; its width is about five times its length; the greatest width is about one third the distance from the inner end. Lower margin of orbit also visible in a dorsal view.

The merus and carpus of the large cheliped of the male are elongate; the outer surface is crossed by short, transverse lines of very fine granules; on the merus these cross the upper margin and extend a little way down the inner surface; the lower margin of the merus is armed with sharp granules which increase in size distally, becoming tubercles towards the end; two or three other rows of fine granules are close to the lower margin on the outer surface. The outer surface of the manus is covered with granules larger above and very fine on the outer surface, not distributed evenly, but somewhat reticulated, leaving small smooth patches. There is an irregular pit behind the union of the fingers. The upper margin has a distinct marginal tuberculated line on its proximal half only; on the distal half the outer surface rounds over to the inner. The inner surface has an oblique ridge extending at an angle of about 45 degrees upward and backward from the lower margin; at about the middle of the palm the ridge turns at a right angle or an obtuse angle and is continued upward to the margin; the ridge is formed by a line of large, irregular tubercles arranged for the most part in a single row. At the base of the dactylus there is a double row of tubercles which superiorly converges more or less towards the ridge at the middle of the palm. The surface between these rows of tubercles is almost smooth. The fingers are long and narrow; between them when closed, there is a gape wider than either finger. A depression on the proximal half of the outer surface of the pollex. Of the tubercles on the prehensile edges, there is one larger

one at the middle of the pollex; and usually also a larger one near the proximal third and another at the distal third of the dactylus. The outer surface of the fingers is smooth through the center, but along the margins more finely granulate than the palm. Proximal end of upper surface of dactylus coarsely granulate.

The merus, carpus and propodus of the ambulatory legs are ornamented with fine scabrous granules, which on the meral joints form transverse lines. The merus of the first three pairs is dilated and that of the third pair is nearly three times as long as wide. A few long hairs on the legs in the male; in the female there is in addition a dense coating of coarse hair on the upper surface of the propodus and a portion of the carpus of the third pair of ambulatory legs and on the posterior margins of the meri and propodi of the third and fourth pairs.

Dimensions.—Male, length 5.6 mm., anterior width 8.1, width between posterior pair of legs 5, greatest posterior width (inferior) 7; length of propodus of large cheliped of a male about 10.4 mm. wide 15.7 mm., length of dactylus of same 11.2, width of propodus 5.6. Ovigerous female, length 6, anterior width 8.8, width between posterior pair of legs 5.4 mm.

Type Locality.—Mangrove Point, Narboro Island, March, 1899, 6 males and 3 females (U. S. Nat. Museum Cat. No. 24829). None of these males have the cheliped as fully developed as a single soft shell male from Black Bight, Albemarle Island, January 9.

Family GRAPSIDÆ.

Grapsus grapsus (Linnæus).

Black Bight, Albemarle Island, January 9, 1 male. Tagus Cove, Albemarle Island, February, 3 males, 1 female.

Taken previously at the Galapagos; found also throughout the tropics.

Geograpsus lividus (Milne Edwards).

Clipperton Island Lagoon, November 23, 3 males, 3 females.

Distribution.—Florida Keys to Sabanilla, Colombia; Lower California to Chile; James Island, Galapagos Archipelago (*Albatross*).

Planes minutus (Linnæus).

On green sea-turtle at base of tail; about 200 miles north of Wenman Island, December 8, one large female.

Pachygrapsus crassipes Randall.

Tagus Cove, Albemarle Island, 12 fathoms, 2 males, 1 female.

Not before taken at the Galapagos. Known from Oregon to Gulf of California; Japan; Hawaiian Islands (Randall), doubtfully correct.

***Pachygrapsus transversus* Gibbes.**

Tagus Cove, Albemarle Island, on reef north of Tagus Hill, March 16, 3 males.

Taken previously at the Galapagos; found also throughout the tropics.

Family PILUMNIDÆ.

PLATYPODIA GEMMATA sp. nov.

(Pl. XII, figs. 5 and 6.)

Anterior two thirds of the carapace divided into about twenty lobules, for the most part circular, except the mesogastric lobule; covered with crowded depressed granules and separated from each other by depressions, filled with a dense furry coating. The front has a thin bilobed edge, the lobes slightly sinuous. The antero-lateral margin is thin and covered above by a short fringe of fur; below, there are three fissures visible, dividing the margin obscurely into four lobes. The postero-lateral borders are short and deeply cut.

The upper border of the merus, carpus and propodus of the chelipeds and ambulatory legs is sharply cristate. The chelipeds are granulated on the outer surface, the granules larger than on the carapace and arranged on the lower half of the hand in four longitudinal rows. The ambulatory legs are partially granulate.

Dimensions.—Ovigerous female, length 6.8 mm, width 9.6, fronto-orbital width 4.9, width of front 2.8.

Type Locality.—On reef north of Tagus Cove, Albemarle Island, March 16; 1 male, 1 ovigerous female, 2 immature females (U. S. Nat. Museum Cat. No. 24850).

LEPTODIUS SNODGRASSI sp. nov.

(Pl. XII, figs. 7 and 8.)

Carapace moderately convex and deeply areolated in its anterior two thirds, flat and smooth in its posterior third. Behind each lobe of the frontal margin a small lobule; behind each of these a larger and very prominent rectangular lobule; still further back a transverse line of four high gastric lobules, the outer pair about one and a half times as wide as the inner; and behind these a granulated line extending nearly across each protogastric lobe. A transverse line of granules, interrupted at the middle, across the widest part of the mesogastric region. The lateral portions of the carapace have each four

prominent elevations, one of which is nodular and situated at the base of the fourth antero-lateral tooth, and three of which are surmounted by broad transverse ridges; of the three ridges the anterior is in a line with the third lateral marginal sinus, the second ridge is in a line with the fourth sinus, while the third is posterior to the last marginal tooth. Front not very prominent, but projecting beyond the inner angle of the orbit, from which it is separated by a notch; bilaminar, the lobes with a slightly concave margin, and most prominent at the inner end. Antero-lateral border cut into four well-marked teeth besides the orbital angle; the first tooth is blunt and situated below the level of the orbital tooth, with which it is connected by a blunt superior ridge; the remaining teeth are acute, the third and fourth very prominent. Lower surface of carapace, edges of upper surface of arm and edges of legs hairy, especially the lower edge of the propodus of the last pair.

Chelipeds very unequal in the male. Upper and outer surface of wrist deeply dimpled or wrinkled; a strong tubercle at inner angle of wrist. Hand with blunt longitudinal carinæ, two on the upper margin and three on the outer surface. The upper carina of the outer surface is broad and has a row of deep pits or dimples; the lowest carina is at the inferior third of the outer surface and is continued along the upper margin of the thumb. The upper part of the inner surface is also pitted. The entire surface of the chelipeds as well as of the carapace is finely and closely granulate and irregularly punctate. The fingers are carinated, the lower carina on the outer surface of the thumb is continued one third the length of the palm. The fingers are black and the color of the thumb is extended on the palm, ending in a zigzag line. The fingers of the large hand gape widely, those of the small hand slightly; dactylus of large hand with two large teeth and a small intermediate one; pollex with two large teeth; tips broadly hollowed out, fingers of small hand with wavy margins. Ambulatory legs flattened, and more or less granulate, the granules fine and forming rugæ. Carpal and propodal joints with a longitudinal groove. Dactylus furred along the edges as far as the nail. Abdomen of male five-jointed.

Dimensions.—Length 13.1 mm., width 20.4, fronto-orbital width 11.8, width of front 5.5.

Type Locality.—Black Bight, Albemarle Island, January 9, one perfect male, type; also a badly damaged remnant of a smaller male (U. S. Nat. Museum Cat. No. 24831).

Additional Locality.—Reef north of Tagus Cove, Albemarle Island, March 16, the lesser cheliped of a small specimen.

Actæa dovii Stimpson.

Actæa dovii STIMPSON, Ann. Lyc. Nat. Hist. N. Y., x, 104, 1871.—A. MILNE EDWARDS, Crust. Rég. Mex., 244, pl. XLV, f. 1, 1879.—FAXON, Mem. Mus. Comp. Zoöl., XVIII, 16, 1895.

Tagus Cove, Albemarle Island, on reef north of Tagus Hill, March 16, one small male. The male of this species is considerably narrower than the female; the width of the male is from 1.4 to 1.42 times its length; of the female from 1.53 to 1.55 times its length. The Galapagos specimen has eleven orange-red stripes extending backward from the frontal and antero-lateral margins and converging posteriorly.

Distribution.—San Salvador; Panama.

Xanthias politus Rathbun.

Micropanope polita RATHBUN, Proc. U. S. Nat. Mus., xvi, 238, 1893.
Panopeus tanneri FAXON, Bull. Mus. Comp. Zoöl., xxiv, 154, 1893; Mem. Mus. Comp. Zoöl., xviii, 19, pl. III, f. 4, 4a, 1895.
Xanthias politus RATHBUN, Bull. Labor. Nat. Hist. State Univ. Iowa, iv, 271, 1898; Proc. U. S. Nat. Mus., xxi, 587, 1898.

Tagus Cove, Albemarle Island, 12 fathoms, one male.

Previously taken off Hood Island, Galapagos, in 20 fathoms; near the Galapagos in 53 fathoms; near Cocos Island, 66 fathoms; and off Lower California in 31 to 36 fathoms.

Pilumnus spinulifer Rathbun.

Pilumnus spinulifer RATHBUN, Proc. U. S. Nat. Mus., xxi, 585, pl. XLII, figs. 6-8, 1898.

Tagus Cove, Albemarle Island, 12 fathoms, 2 males, 1 young female.

Tagus Cove, on reef north of Tagus Hill, March 16, 1 male.

These specimens are smaller than the types. The series indicates that the relative width increases with size. The types had a nearly naked carapace and chelipeds, remarkably so for a *Pilumnus*. The Galapagos specimens have however a downy coating of hair, thicker on the anterior portion of the carapace, where there are also a few tufts of longer and stouter setæ. The relative bareness of the large specimens may be due to age, environment or accident.

Distribution.—Off Cape St. Lucas, 31 fathoms.

PILUMNOIDES PUSILLUS sp. nov.

(Pl. XII, figs. 9 and 10.)

Carapace one fourth broader than long, slightly convex, somewhat lobulate, the protogastric region divided in two by a longitudinal furrow, the area adjacent to the antero-lateral margin broken up into four or five lobules; entire surface very finely granulate. Margin of frontal

lobes slightly convex except for a squarish tooth at the outer angle. Antero-lateral border distinctly marked, almost limbed, and furnished with four tuberculiform teeth besides the orbital which is small and little prominent. First, second and third teeth subequal, fourth tooth much smaller; from it a crest extends obliquely inward and backward on the carapace.

Chelipeds nearly equal. Outer and upper surface of carpus, and upper surface of manus nodulous. A granulated longitudinal ridge on the outer surface of the manus. Pollex with two carinæ, the lower of which extends back on the palm. Dactylus with a deep superior furrow. The fingers of the larger cheliped when closed leave a small hiatus at base; those of the smaller cheliped either have a smaller hiatus or fit tight together. Ambulatory legs sparsely hairy.

Dimensions.—Male, length 2.4 mm., width 3.

Locality.—Tagus Cove, Albemarle Island, on reef north of Tagus Hill, March 16, 2 males (U. S. Nat. Museum Cat. No. 24832).

Eriphia granulosa A. Milne Edwards.

Tagus Cove, Albemarle Island, on reef north of Tagus Hill, March 16, 1 male, 2 females, 3 young.

Distribution.—Chile (type locality); Chatham Island, Galapagos (Dr. W. H. Jones, U. S. N., collector).

Eriphides hispida (Stimpson).

Tagus Cove, Albemarle Island, Feb. 8, 1 male.

Previously taken at Albemarle Island by the *Albatross*; also occurs at Panama and west coast of Central America.

Family PORTUNIDÆ.

Portunus (Achelous) angustus Rathbun.

Tagus Cove, on reef north of Tagus Hill, March 16, 4 young.

Tagus Cove, 12 fathoms, 1 young.

Type Locality.—Off Hood Island, Galapagos, 20 fathoms.

PORTUNUS (ACHELOUS) STANFORDI sp. nov.

(Pl. XII, fig. 11.)

Carapace pubescent; ridges very prominent; those on the cardiac region especially high; two large tubercles at the inner angle of the branchial region. Fronto-orbital width about three fifths of the width of the carapace (exclusive of spines). Front prominent; eight teeth between the orbits, two small, above each antenna; the four middle teeth are subequal, subacute, the outer pair a little wider at base than

the inner, the inner pair more advanced and separated from each other by a V-shaped sinus and from those of the outer pair by a U-shaped sinus. The angle on the inner side of the outer of the superior orbital fissures is rather prominent. The tooth at the outer angle of the orbit is equally advanced with the outermost of the eight frontal teeth. Of the antero-lateral spines or teeth, the second, fourth and sixth, are smaller than the others and themselves diminish in the order named; the first and second are subacute, the rest sharp. The ninth spine (at the lateral angle) is about two and a half times as long as the eighth or preceding spine; it is directed outward and upward. The inner sub-orbital tooth is produced to the line of the median sinus of the front; outer sinus small, V-shaped.

The merus of the chelipeds bears five spines on its anterior margin, of which the proximal one or two are smaller; posterior margin terminating in a small curved spine. Carpus with a small outer spine and a long stout inner spine. Manus with two spines, one near the carpus and one near the distal end of the upper margin. Postero-distal angle of merus of swimming feet armed with a spine.

Dimensions.—Total length of carapace of a male 13.4 mm., width 23, width between last antero-lateral sinuses 17.9; exorbital width 10.8.

Type Locality.—Tagus Cove, Albemarle Island, on reef north of Tagus Hill, 2 males, 3 young (U. S. Nat. Museum Cat. No. 24833).

Affinity.—This species is near *Portunus* (*Achelous*) *minimus* from the Gulf of California, but may be distinguished by its more uneven carapace, advanced front, longer lateral spine and the spine on the merus of the swimming feet.

Family MAIIDÆ.

Stenorynchus debilis Smith.

Tagus Cove, Albemarle Island, 12 fathoms, 2 females.

Tagus Cove, on reef north of Tagus Hill, March 16, 1 male, 1 young female.

Distribution.—Lower California to Chile, from low water mark to 31 fathoms. Not before noticed from the Galapagos.

PODOCHELA MARGARITARIA sp. nov.

(Pl. XII, fig. 12.)

Carapace about one and a third times as long as wide. Gastric and cardiac regions very high, each surmounted by a tubercle. Hepatic region with a prominent tubercle projecting downward below the lateral line. No postorbital lobe. Front long and hood-shaped, the pos-

terior part flat and thick, the anterior and outer part thin, hollow beneath and with a sharp median crest above. Marginal crests of the basal segment of the antennæ thin and finely denticulate. Pterygostomian region armed with a tubercle. Sternum and outer portions of the abdomen covered with pearly granules.

The palms of the chelipeds are strongly inflated; fingers narrowly gaping when closed. The ambulatory legs diminish rapidly and uniformly in length from the first to the fourth pair. The dactyli vary little in length; the distal portion of the propodi of last three pairs is slightly thickened and curved.

Dimensions.—Male, length 15 mm., width 11.

Type Locality.—Tagus Cove, Albemarle Island, 12 fathoms, one male (U. S. Nat. Museum Cat. No. 24834). Two smaller males and a female were taken at Tagus Cove on the reef north of Tagus Hill.

***Lissa aurivilliusi* Rathbun.**

Tagus Cove, Albemarle Island, on reef north of Tagus Hill, March 16, 1 male.

Distribution.—Off Lower California, 12 to 31 fathoms.

***Teleophrys cristulipes* Stimpson.**

Tagus Cove, Albemarle Island, on reef north of Tagus Hill, March 16, 1 male.

Distribution.—Lower California and Bay of Panama; Pernambuco and Maceio, Brazil; Fernando Noronha (Pocock).

***Mithrax bellii* Gerstæcker.**

Mithrax ursus BELL, Proc. Zool. Soc. London, III, 171, 1835; Trans. Zool. Soc. London, II, 52, pl. x, f. 2 and 3, 1836.—A. MILNE EDWARDS, Crust. Rég. Mex., 103, 1875. Not *Cancer ursus* HERBST.
Mithrax bellii GERSTÆCKER, Arch. f. Natur., XXII, pt. 1, 112, 1856.

Black Bight, Albemarle Island, one male; a fine specimen of a deep rich crimson. Length 63.6 mm. width 65.4. The chelipeds, as would be expected, are considerably larger than those of the female figured by Bell; the movable finger has a large tooth at its basal third. The rostral horns are shorter than in Bell's figure, being in our specimen no longer than the horns of the basal antennal segment.

Distribution.—Galapagos, 6 fathoms (type locality); Chile (Miers).

***Mithrax nodosus* Bell.**

Black Bight, Albemarle Island, Jan. 9, 2 males.

Tagus Cove, Albemarle Island, on reef north of Tagus Hill, March 16, 3 males, 2 females, 2 young.

Distribution.—Galapagos Islands (type locality; also collected by the *Albatross*); Chile (Miers).

***Microphrys platysoma* (Stimpson).**

Tagus Cove, Albemarle Island, on reef north of Tagus Hill, March 16, 1 female.

Distribution.—Lower California; Porto Rico, 4 to 14 fathoms. New to the Galapagan fauna.

***Microphrys branchialis* Rathbun.**

Microphrys branchialis RATHBUN, Proc. U. S. Nat. Mus., XXI, 577, pl. XLI, f. 5, 1898.

Two small males were collected at Tagus Cove, one in 12 fathoms, the other on the reef north of Tagus Hill. They vary from typical specimens from Lower California in the following particulars. The carapace bears fewer tubercles, the postero-lateral spine is reduced, the oblong branchial protuberance is more prominent, the rostral horns and the antero-external spine of the basal antennal joint are shorter. These variations are no greater than those afforded by *Microphrys bicornutus* (see A. Milne Edwards in Crust. Rég. Mex., pl. xiv, figs. 2-4).

M. branchialis was hitherto known from the Gulf of California and the west coast of Lower California in 12 to 48 fathoms.

Suborder MACRURA.

Family SCYLLARIDÆ.

PSEUDIBACUS PFEFFERI Miers.

Pseudibacus pfefferi MIERS, Proc. Zool. Soc. Lond., 1882, p. 542, pl. XXXVI, figs. 2 and 3.

Following is a description of the specimen in hand: Carapace about one third broader than long, concealing the legs. The surface is nearly smooth; there is a short tuberculated median crest on the gastric region; two similar longitudinal crests separated by a narrow median depression on the cardiac region; posteriorly these crests unite in one which is continued to the posterior margin of the carapace; a few depressed tubercles form a longitudinal line toward the inner side of each branchial region; a tuberculated ridge runs parallel and close to the outer margin of the branchial region. The lateral margin is arcuate, interrupted at the anterior third by a V-shaped notch, from which a short, smooth ridge extends inward on the carapace. The margin

is thin and cut in small shallow teeth, of which there are about seven in front of the notch and fourteen behind it. The orbits are situated about half way between the middle and the lateral angles; the inner margin of the orbit is erect. The margin of the front is nearly straight except outwardly where it is concave, curving forward to form a strong antero-lateral tooth with a spiniform tip pointing forward. The rostral lobe is divided half way to its base forming two narrow ascending horns separated by a closed fissure. The peduncle of the antennules reaches a little beyond the end of the penult segment of the antennæ; the inner flagellum is much thinner and a little longer than the outer. The leaf-like expansion of the antepenultimate segment of the antenna terminates in a sharp spine; its outer margin has two teeth, its anterior margin one tooth; the inner margin of this segment as well as of the succeeding segment is erect and bidentate; the terminal segment is sharp-pointed in front; the margins of the antennæ are finely denticulate or crenulate.

The second to fifth abdominal segments have a convex tuberculated median carina; that on the fourth segment has posteriorly a curved backward-pointing spine; a similar but smaller spine is on the fifth segment; the sixth segment has a tubercle either side of the median line and a small posterior median spine; the seventh segment has a median tubercle on its anterior portion. The lateral margins of the second to seventh segments are divided into several triangulate lobes or teeth; on the second to sixth segments there is a large compound tubercle at the junction of the dorsal surface with the pleura. The meral and carpal joints of the legs have each a superior distal spine.

Dimensions.—Length of body from the tip of the antennæ 39 mm., length of carapace 13.2, width of carapace 18, length of antepenult segment of antenna 7, width of same 8. As the specimen has a very thin soft shell the measurements are only approximately accurate.

Locality.—One specimen was taken from the stomach of a green turtle, 200 miles north of Clipperton Island, December 8.

This specimen differs from Miers's description of specimens from Mauritius, chiefly in having a wider carapace, and also a wider antepenultimate antennal segment, this segment being broader than long instead of longer than broad, as in the figure given by Miers; the segment is also more strongly dentate in our specimen. Considering the state of the type specimens, dried cast shells, and the half digested condition of the West American example it seems best to consider them probably identical.

Family PALINURIDÆ.

Panulirus penicillatus (Olivier).

Wenman Island, December, 2 specimens.

Tagus Cove, Albemarle Island, 1 specimen.

Distribution.—Recorded from the Red Sea, via Indian Ocean to the South Pacific at Tahiti, Fijis, etc. Honolulu (*Albatross*); Waiawa Kanai, Hawaiian Islands (Valdemar Kundsén, collector); Chatham Island, Galapagos (Dr. W. H. Jones, U. S. N., collector).

Family PENÆIDÆ.

Penæus brevirostris Kingsley.

Penæus brevirostris KINGSLEY, Proc. Acad. Nat. Sci. Phila., 98, 1878.

Penæus canaliculatus HOLMES (not Olivier), Proc. Cal. Acad. Sci. (2), IV, 581, 1895.

Penæus californiensis HOLMES, Occas. Papers Cal. Acad. Sci., VII, 218, pl. IV, f. 64-69, 1900.

Tagus Cove, Albemarle Island, Feb. 8, 1 male.

This species differs from *P. brasiliensis* Latreille in its shorter and higher rostrum; in full grown *P. brasiliensis* the rostrum exceeds the antennular peduncle; in *P. brevirostris* it does not. The dorsal grooves reach nearer the posterior margin of the carapace in *P. brevirostris*, and posteriorly they are parallel, not as in *P. brasiliensis* somewhat convergent. The thoracic feet are shorter and a little stouter in *P. brevirostris*. The form of the petasma and thelycum is also specifically different from that in *P. brasiliensis*.

P. canaliculatus Olivier differs from *P. brevirostris*, according to Kishinouye,¹ in having only one tooth under the rostrum, in the median dorsal groove of the carapace being nearly equal in breadth to the lateral grooves, in the first pair of feet unispinose, and the different shape of the thelycum.

Distribution.—A huge female, 17.8 cm. long, was taken at San Diego, Cal., by Dr. D. S. Jordan, February, 1880; a smaller male, by the *Albatross* off Santa Monica, Cal. San Francisco Bay and near Anaheim, Cal. (Holmes). This is undoubtedly the species recorded by Kingsley from the west coast of Nicaragua and by Mr. Richard Rathbun under the name of *P. brasiliensis*, as being brought to the San Francisco markets in 1879; the latter notes the large size (7 inches). There are many specimens in the National Museum, ranging from Lower California to Panama.

¹Jour. Fisheries Bureau, Tokyo, Japan, VIII, pp. 6 and 11, pl. I, and pl. VII, fig. 1, 1900.

PARAPENÆUS KISHINOUEI sp. nov.

(Pl. XII, figs. 13-15.)

Carapace covered with a very fine pubescence easily rubbed off and arising from crowded irregular pits. A median gastric spine at about the anterior third; median carina scarcely continued behind this spine. Upper margin of rostrum arched, the distance of the teeth from the lateral rib diminishing from the proximal to the distal end; teeth 7 to 9, continued to the tip; lateral rib also curved; lower margin entire and ascending, nearly straight. Rostrum reaching just beyond the end of the first antennular segment. The second antennular segment is twice the length of the third.

The basis and ischium of the first pair of pereopoda are each armed with a spine. A pair of spines on the sternum between the second pereopoda. The surface of the abdomen is pubescent and punctate like the carapace though less completely so. The posterior two thirds of the third segment is carinated, also the whole length of the fourth, fifth and sixth segments; the sixth segment is twice as long as the fifth; the lateral margins of the telson have each three spines increasing in size posteriorly; near the posterior pair is a pair of shorter fixed spines.

The petasma is not bilaterally symmetrical; its left half is the longer and its distal portion is ovate and at the anterior end quite narrow. The central plate of the thelycum is semicircular; the lateral plates are broad and fused.

Dimensions.—The length of the largest specimen is about 33 mm.

Locality.—The types were taken at Tagus Cove, on the reef north of Tagus Hill, Albemarle Island, March 16; 4 males, 3 females (U. S. Nat. Museum Cat. No. 24835). 2 males and 2 females were also taken in 2 fathoms in Tagus Cove.

Allied to *P. velutinus* (Dana? Bate). In that species the rostrum has fewer teeth and is less arched, the second abdominal segment is carinated, the petasma and thelycum are different.

The species is dedicated to Dr. Kishinouye who has recently monographed the Penæids of Japan.

Family ALPHEIDÆ.

Alpheus malleator Dana.

Alpheus malleator DANA, Crust. U. S. Expl. Exped., 1, 557, 1852; pl. xxxi, f. 9, 1855.

Alpheus pugillator A. MILNE EDWARDS, Bull. Soc. Philom., Paris (7), 11, 229, 1878.

Tagus Cove, Albemarle Island, on reef north of Tagus Hill, March 16; one small specimen 12.5 mm. long.

Distribution.—Rio Janeiro? (Dana); Cape Verde Islands (A. Milne Edwards).

Synalpheus neptunus (Dana).

Alpheus neptunus, DANA, Crust. U. S. Expl. Exped., 1, 553, 1852; pl. xxxv, f. 5, 1855.

Synalpheus neptunus COUTIÈRE, Ann. Sci. Nat. (8), Zoöl., ix, 15, 1899.

Two specimens were taken at Tagus Cove, Albemarle Island, on the reef north of Tagus Hill. In these specimens the rostral spine is longer than the orbital, but still not reaching the end of the first antennular segment. The antennular scale reaches one half the length of the second antennular segment. The blade of the antennal scale reaches just beyond the middle of the third antennular segment; the spine of the scale scarcely reaches the end of the antennular peduncle. The basal spine of the antenna exceeds the first antennular segment a little. The antennal peduncle is longer than the antennular.

Distribution.—Sulu Sea, $6\frac{1}{2}$ and 9 fathoms, and Fiji Islands (Dana); Red Sea (Heller, Paulson); Bermudas; Porto Rico, 10 fathoms.

Family DISCIDÆ fam. nov.

Monocarpinea in which the animal is smoothly rounded, not carinated; the rostrum short, depressed; the antennules biflagellate, the outer flagellum with a thickened basal portion; the antennal scale short and broad; the mandible furnished with a molar process and palp; the external maxillipeds provided with an exognath; all the pereopods with exopods; first pair of pereopods much larger than the second; both pairs with extremity of merus cup-shaped and articulating at its lower angle only, with the carpus; carpus short; dactylus of first pair circular; pollex slender; fingers of second pair normal; feet of last three pairs diminishing regularly in length, and having dactyli spinulous beneath.



FIG. 1. *Discias serrifer*, mandible, much enlarged.

This family is allied to the Atyidæ and the Oplophoridæ (= Acanthephyridæ). The Atyidæ inhabit fresh water; they have the first two pairs of pereopods similar, with spoon-shaped fingers, and the mandible without a palp. In the Oplophoridæ the animal is dorsally carinated, the antennal scale is long and rigid, the first two pairs of pereopods are long, slender and similar.

Genus **Discias** gen. nov.

Characters of the family.

DISCIAS SERRIFER sp. nov.

Adult female.—Carapace stout, somewhat compressed, the height greater than the width and more than two thirds of the length; smooth, punctate. Rostrum resembling that of *Atya*, deflexed, depressed, with a smooth median carina; lateral margins thin, finely denticulate; extremity acute, not reaching the end of the first antennular segment. A large spine at the lower angle of the orbit. Antero-lateral angles obliquely rounded, unarmed. Eyes large. Second and third antennular segments very short, the third a little the longer; the flagella are broken off; the inner one is at least as long as the peduncle. The antennal peduncle extends to the end of the first segment of the antennular peduncle; scale oval, exceeding the antennular peduncle by a distance equal to the length of the last two segments of that peduncle; it has a midrib, its outer margin is thin and without a spine, inner margin finely denticulate; flagellum half the length of the body.

FIG. 2.
Discias serrifer, outer
maxilliped
($\times 17$).

The outer maxilliped does not quite reach the end of the antennal scale; the terminal segment is narrowly oval and its margins are spinulose.

The first pair of chelipeds exceed the scale by about the length of the fingers; the merus is triquetral and widens toward the distal end which is hollowed out and at its lower angle articulates with the carpus. The carpus is reduced to a flat round plate articulated against the lower surface of the propodus, a proximal prolongation of which conceals it. The carpus is not visible in Fig. 3. The propodus is oblong, narrowest at the proximal end, the palmar portion less than twice as long as broad and having on its upper surface a broad longitudinal depression; pollex slender, strongly curved, fitting closely against the dactylus which is subcircular or broadly ovate, slightly obtusely pointed at the extremity.

The chelipeds of the second pair fall short of the end of the palm of the first pair; they are much smaller; the merus is similar to that of



FIG. 3.
Discias serrifer,
chela of
the first
pereiopod
($\times 20$).

the first pair; the carpus is well developed, but small and rounded, the palm is oblong, twice as wide as long; the fingers resemble each other, are moderately broad, longitudinal in direction, curved and cross at the tips.

The third pair of feet are a little longer than the second; the fifth pair reach the end of the merus of the third.

The postero-inferior angles of the fifth and sixth segments of the abdomen are subacute; sixth segment about one and a third times as long as the fifth; the telson is one and three fifths times as long as the sixth segment and has two pairs of lateral spinules, the extremity is rounded and armed with about ten or twelve spinules; the uropods are scarcely longer than the telson, oval, the outer is the broader and along its outer margin is cut into from ten to twelve teeth, becoming gradually a little smaller and closer towards the posterior extremity.

The eggs are rather large, measuring a millimeter in the lesser diameter.

Type Locality.—Three ovigerous females were taken at Tagus Cove, Albemarle Island, on the reef north of Tagus Hill, March 16, 1899 (U. S. Nat. Museum Cat. No. 24836).

Dimensions.—Female, length about 15 mm., length of carapace and rostrum 5 mm.

Family PALÆMONIDÆ.

PALÆMON sp.

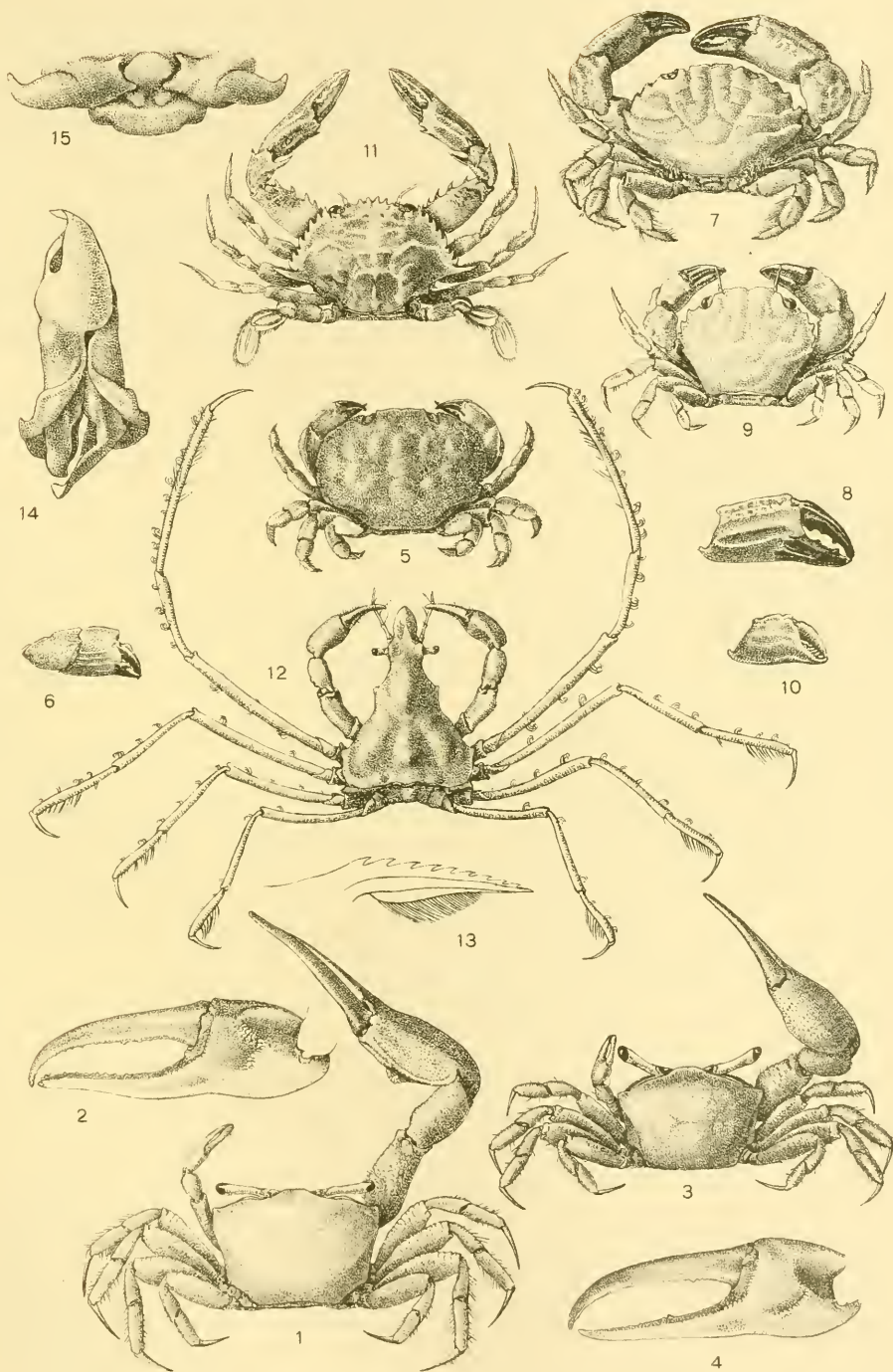
Clipperton Island Lagoon, Nov. 23, 1898, one specimen, 27 mm. long, the large pair of chelipeds missing. Very near *P. ritteri* Holmes, but differs from specimens of that species from Lower California, in being more slender, the rostrum a little more ascending, and slightly arched above the extremity of the eyes, the eyes black in alcohol instead of pale, the sixth abdominal segment a little longer (twice as long as fifth). The first pair of chelipeds and the antennæ correspond to *P. ritteri*.



FIG. 4. *Dischias serrifer*, tail fan ($\times 14$).

PLATE XII.

- FIG. 1. *Uca galapagensis* ($\times 1\frac{1}{2}$).
 2. " " inner view of large chela ($\times 1\frac{1}{2}$).
 3. *Uca helleri*, type ($\times 3$).
 4. " " from Black Bight, inner view of large chela ($\times 3$).
 5. *Platypodia gemmata* ($\times 3$).
 6. " " wrist and chela ($\times 3$).
 7. *Leptodius snodgrassi* ($\times 1\frac{1}{2}$).
 8. " " larger chela ($\times 1\frac{1}{2}$).
 9. *Pilumnoides pusillus* ($\times 7$).
 10. " " larger chela ($\times 7$).
 11. *Portunus (Achelous) stanfordi* ($\times 1\frac{1}{2}$).
 12. *Podocheila margaritaria* ($\times 2$).
 13. *Parapeneus kishinouyei* rostrum ($\times 6\frac{1}{2}$).
 14. " " petasma, much enlarged.
 15. " " thelycum, " "



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PAPERS FROM THE HARRIMAN ALASKA
EXPEDITION.

XXIX.

THE MOSSES OF ALASKA.

By J. CARDOT AND I. THÉRIOT.

INTRODUCTION.

THE following catalogue of the mosses of Alaska and some adjacent islands is based primarily upon the collection made by the Harriman Expedition in 1899. For completeness, however, species previously reported from the region are also included.

The whole number here enumerated is 280, of which 124 are new to Alaska and 46 are new to science. The 29 new species and 17 new varieties, except for three species of *Bryum*, are here first described.

The mosses brought back by the Harriman Expedition were collected by Wm. H. Brewer, W. R. Coe, L. J. Cole, F. V. Coville, T. H. Kearney, De Alton Saunders and Wm. Trelease.

Previous collections were made by W. H. Dall, 1867; Krause brothers, 1882; W. G. Wright, 1891; Jas. M. Macoun, 1891-92; B. W. Evermann, 1892; C. H. Townsend, 1893-95 (Exp. of U. S. S. *Albatross*); W. M. Canby, 1897; W. H. Evans, 1897; W. A. Setchell, 1899; F. C. Schrader, 1899.

Subclass **ANDREÆALES.**Family **ANDREÆACEÆ.**

Andreæa petrophila Ehrh. in Hann. Mag., 1784, p. 140, and in Beitr 1, p. 192.

From Orca (Trelease, 2245), Hall Island (Trelease, 2127), St. Matthew Island (Trelease, 2168, 2530). New to Alaska.

Andreæa petrophila sylvicola Bryol. eur., VI, p. 13, pl. 2, c.

From Hall Island (Trelease, 2527). New to Alaska.

Andreæa parvifolia C. Müll. in Flora, 1887, p. 219.

From upper part of Dyea valley (Krause brothers).

Andreæa papillosa Lindb. in Oefv. af Vet. Ak. Forh., XXIII, p. 557.

From St. Lawrence Bay, and Plover Bay, Siberia (W. H. Dall).

Subclass **BRYALES.**Family **WEISIACEÆ.**

Gymnostomum curvirostre scabrum Lindb. Musc. scand., p. 22.

From Port Wells (Trelease, 1834). New to Alaska.

Anæctangium compactum Schw. Suppl. I, 1, p. 36, pl. XI.

From White Pass, 1,900 feet (Trelease, 2309); Orca (Trelease, 2259, 2260 in part).

ANÆCTANGIUM COMPACTUM ALASKANUM var. nov.

Habitu robustiore, foliis madore magis patulis, longioribus latioribusque, cellulis majoribus (mediis 6-9 μ latis, loco 4-6) reteque magis opaco distinctum.

From Port Wells (Trelease, 1832).

Dicranoweisia crispula Lindb. in Oefv. af Vet. Ak. Forh., 1864, p. 230.

From White Pass, 3,000 feet (Trelease, 2492); Port Clarence (Trelease, 2119); Hall Island (Trelease, 2129, 2131, 2134); St. Matthew Island (Trelease, 2153, 2154); Attu Island (J. M. Macoun).

Most of these specimens have the inner perichæatial bracts shortly acuminate, which relates them to *D. contermina* Ren. & Card. (*D. roellii* Kindb.), but the alar cells are usually more distinct than on the moss from Oregon and Idaho. Moreover, the comparison with numerous specimens from different regions of Europe and North America proves that the characters on which *D. contermina* has been established

are too variable and insufficient to establish a specific distinction. *D. contermina* must therefore be considered as only a variety of *D. crispula*, and the specimens from Alaska and the islands of Bering Sea are nearly all intermediate between the type and this variety.

D. obliqua Kindb., which has been recorded from Alaska, is unknown to us; but, from the description, it is probable that it, likewise, is only a form of *D. crispula*. (Cfr. Kindberg, Notes on Canadian Bryology, 1893, and Eur. and N. Amer. Bryinæ, p. 210.)

Rhabdoweisia fugax Br. eur., fasc. 33-36, p. 4, pl. 41.

From Kodiak (Trelease, 2217, 2218). New to Alaska.

Rhabdoweisia fugax subdenticulata Boul. Musc. de la France, p. 543.

From Juneau (Brewer and Coe, 699a). New to Alaska.

Another species of Weisiaceæ, *Oreoweisia serrulata* Sch., has been recorded from Nulato by J. T. Rothrock and by Lesquereux and James (Manual, p. 58).

FAMILY DICRANACEÆ.

Cynodontium torquescens Limpr. Laubm., 1, p. 288.

From Port Clarence (Trelease, 2101, 2102, 2525).

Number 2101 has the peristome smooth or nearly so; it is *C. subalpestre* Kindb. in Mac. Cat. Can. pl., VI, Musci, pp. 17 and 257.

CYNODONTIUM TRELEASEI sp. nov.

(Pl. XIII, figs. 1^{a-d}.)

Monoicum, densiuscule cespitosum. Caulis erectus, brevis, 3-4 millim. altus. Folia siccitate crispata, madore patentia, 2-3 millim. longa, e basi oblonga sat subito constricta, longe et anguste acuminato-subulata, apice sinuato denticulata, marginibus planis et integris, costa percurrente, cellulis inferioribus rectangulis, 2-3 long. quam lat., superioribus irregularibus, plerisque subquadratis, opacis et papillois, 9-15 μ longis, 8-9 latis, cellulis alaribus majoribus, subinflatis, lutescentibus. Flos masculus in ramo brevi. Folia perichætialia intima vaginantia, longe acuminata. Capsula in pedicello brevi, 7-8 millim. longo, nutans vel inclinata, breviter ovato-convexa, interdum strumulosa, levis vel vix striatula, operculo longe oblique rostrato, basi crenulato. Annulus distinctus. Peristomium elatum, intense purpureum, 0.5 millim. altum, valde papillosum, dentibus irregulariter bi-trifurcatis. Sporæ leves, 16-18 μ crassæ.

From Port Wells (Trelease, 2268, 2271).

This species is only comparable with *C. polycarpam* Sch., from which it is easily distinguished by its smaller size, its shorter, smooth or

hardly striate capsule, its more papillose, longer and brighter purple peristome, its shorter leaves with a thinner subula, and its upper cells smaller and less distinct.

CYNODONTIUM POLYCARPUM ALASKANUM var. nov.

A forma typica differt foliis apice tantum denticulatis, marginibus minus late et minus longe revolutis, reteque levi vel sublevi, cellulis superioribus paulo majoribus et distinctioribus ($20 \times 13 \mu$, loco 14×11); a var. *laxirete* Dix. foliis angustioribus et rete basilari densiore distinctum; ab *Oncophoro suecico* Arn. et Jens. differt foliis inferne revolutis cellulisque alaribus indistinctis vel parum distinctis.

From Juneau (Trelease, 2176); Cape Fox (Trelease, 2374); Indian Camp, Yakutat Bay (Brewer and Coe, 645).

The type has been indicated for Alaska by Kellogg and by Lesquereux and James (Manual, p. 58).

Cynodontium virens Sch. Br. eur. Coroll., p. 12.

From Haenke Island (Coville and Kearney, 1110). A doubtful specimen from St. Matthew Island (Trelease, 2155).

Cynodontium virens serratum Sch., loc. cit.

From Haenke Island (Coville and Kearney, 1111); Egg Island (Coville and Kearney, 1016, 1017); Port Wells (Trelease, 2290; Brewer and Coe, 654); St. Matthew Island (Trelease, 1891).

Cynodontium wahlenbergii Hartm. Flor. scand., ed. 10, p. 113.

From Cape Vancouver (J. M. Macoun); Port Wells (Trelease, 1830, 2288 in part, 2289); Port Clarence (Brewer and Coe, 669); Hall Island (Trelease, 1882, 1898, 1899, 2130, 2132); St. Lawrence Island (Trelease, 1895, 1896, 1897, 2124); St. Matthew Island (Trelease, 1892, 1906, 2156, 2157, 2162).

Number 2130 is a small form with short leaves, forma *brevifolia*.

Dichodontium pellucidum Sch. Br. eur. Coroll., p. 12.

From Hidden Glacier Inlet in Yakutat Bay (Trelease, 1816, 2154 in part); Disenchantment Bay (Brewer and Coe, 639 in part); Muir Glacier (Trelease, 1752 in part); Port Wells (Trelease, 1831); Unalaska Island (J. M. Macoun).

Dichodontium pellucidum fagimontanum Sch., loc. cit.

From Juneau (Trelease, 2171); Muir Glacier (Trelease, 1909 in part).

Numbers 1816, 2154 in part and 1831 are forms passing to var. *fagimontanum*.

DICHODONTIUM PELLUCIDUM KODIAKANUM var. nov.

(Pl. XIII, fig. 2^{a-b}.)

Magnitudine *D. flavescenti* Lindb. simile, 5-8 centim. altum; folia subintegra, apice late obtuso tantum sinuolata, rete vix papilloso.

From Kodiak (Trelease, 1848).

D. pellucidum serratum Sch. (*D. flavescens* Lindb.) has been recorded from Alaska by Kindberg.

Aongstroemia longipes Br. eur., fasc. 33-36, p. 3, pl. 1.

From Muir Glacier (Trelease, 2422, 2466, 2468); Hidden Glacier Inlet, in Yakutat Bay (Trelease, 2519). New to Alaska.

Dicranella crispa Sch. Br. eur. Coroll., p. 13.

From Yakutat Bay (Trelease, 2334); St. Lawrence Island (J. M. Macoun).

Dicranella grevilleana Sch., loc. cit.

From Port Clarence (Trelease, 2103). New to Alaska.

Dicranella rufescens Sch., loc. cit.

From Prince of Wales Island (J. M. Macoun).

Dicranella heteromalla Sch., loc. cit.

From Juneau (Trelease, 2180; Setchell, 1235); Farragut Bay (Coville and Kearney, 470); Kodiak (Trelease, 2206, 2213, 2214); Douglas Island (Trelease, 2405, 2407, 2411); Prince of Wales Island (J. M. Macoun); Yes Bay (Gorman, 182 in part, 183).

Dicranella heteromalla orthophylla Lesq. & Jam. Manual, p. 67.

From Sitka (Trelease, 2367); Kodiak (Trelease, 2197); Douglas Island (Trelease, 2411).

DICRANELLA HETEROMALLA LATINERVIS var. nov.

A forma typica differt foliis brevius subulatis costaque latiore, circa $\frac{1}{3}$ basis occupante.

From Douglas Island (Trelease, 2389).

D. squarrosa Sch. was recorded from Alaska, teste M. W. Harrington, by Lesquereux and James, and *D. subulata* Sch. and *D. polaris* Kindb. from the islands of Bering Sea, teste Macoun, by Kindberg. The specimen received by us as *D. subulata*, from St. Lawrence Island is *D. crispa*. We have not seen any specimens of the other two species.

Dicranum anderssonii Sch. Syn., ed. 1, p. 689.

From Port Wells (Trelease, 2277). New to Alaska.

This moss undoubtedly belongs to *D. anderssonii* Sch. (*Arctoa anderssonii* Wich. in Flora, 1859, no. 27). In his second edition of the Synopsis, Schimper reunites it to *D. hyperboreum*, from which, however, it seems sufficiently distinct by its smaller, subglobose capsule, turbinate after the fall of the lid, very shortly pedicellate and almost always surrounded and surpassed by the perichæatial leaves, and by the cells of the exothecium being smaller, with more solid and more colored walls. According to C. Jensen (Bryophyta of the Faeroes, in his Botany of the Faeroes, p. 159), the capsule of *Dicranum anderssonii* should be destitute of stomates, but in the Port Wells specimen all the capsules bear several stomates at the base of the very short neck.

Dicranum starkei Web. & Mohr, Bot. Taschb., pp. 189, 471.

From Yakutat Bay (Trelease, 2059); Disenchantment Bay (Brewer and Coc, 635). New to Alaska.

Dicranum albicans Br. eur., fasc. 43, Suppl., pl. 1.

From Yakutat Bay (Trelease, 2059 in part). New to Alaska.

A form of greener tint than usual and with homomallous leaves.

Dicranum strictum Schl. Pl. crypt. helv., cent. III, no. 26.

From Yakutat Bay (Trelease, 2331, 2336).

DICRANUM SUBFLAGELLARE sp. nov.

(Pl. XIII, fig. 3^{a-c}.)

A *D. flagellari* proximo differt defectu flagellarum, foliis erectis subfalcatis angustioribus parum flexuosis, brevioribus (2-2.5 millim.), acumine canaliculato non subtubuloso, marginibus dorsoque subintegro cellulisque inferioribus angustioribus, superioribus multo minoribus. Specimina pauca, sterilia.

From Kodiak (Trelease, 1899).

Dicranum elongatum Schl. Pl. crypt. helv., cent. III, no. 27.

From Port Clarence (Trelease, 1867 in part, 2117, 2118); Kodiak (Trelease, 2503); St. Lawrence Island (Trelease, 1892, 1894, 1897 in part); St. Matthew Island (Trelease, 2170).

Number 2503 is a short, stunted form, with nearly the facies of *D. miquelonense* Ren. & Card.

Dicranum groenlandicum Brid. Mant. musc., p. 68. Bryol. univ., 1, p. 460.

From the Yukon River (W. H. Dall); Port Clarence (Trelease, 1867 in part). New to Alaska.

Dicranum fuscescens Turn. Musc. hib., p. 60, pl. 5, f. 1.

From Yes Bay (Gorman, 184); Juneau (Brewer and Coe, 699b, 700); Skagway (Canby, 478); Wrangell (Trelease, 2317); White Pass, 3,000 ft. (Trelease, 2313); Farragut Bay (Trelease, 2416; Brewer and Coe, 617); Yakutat Bay (Trelease, 1763, 2340); Point Gustavus (Coville and Kearney, 777); La Perouse Glacier (Trelease, 2498); Sitka (U. S. S. *Albatross*, 53, 55; Canby, 458, 463; Trelease, 2359); Hot Springs (Trelease, 1914); Kodiak (Trelease, 1853); Douglas Island (Trelease, 1908, 2392); Port Wells (Trelease, 2282, 2288); Orca (Trelease, 1918, 1925, 2262; Setchell, 1213); New Metlakatla (Coville and Kearney, 364); Plover Bay, Siberia (Trelease, 1865).

The Yes Bay specimen was associated with *Mnium glabrescens* Kindb. and *Scapania* sp.

The Kodiak specimen (1853) is a paludal form, with entire, shorter, erect leaves. We must point out too a sterile form, collected on Unalaska Island by Mr. C. H. Townsend (U. S. S. *Albatross* exped., 43), which is very near *D. muehlenbeckii* Br. eur. var. *brevifolium* Lindb. The same form was found by Trelase on Hall Island (1907). It differs from the European plant chiefly in having its leaves less flexuous when dry.

Many authors separate *D. congestum* Brid. from *D. fuscescens* Turn. but as it is almost impossible to find two descriptions of *D. congestum* which agree, we can infer that it is one of those species which every author understands in his own way, that is to say a very bad species; and we deem it preferable to merely unite it with *D. fuscescens*.

Dicranum dipteroneuron C. Müll. in Flora, 1887, p. 221.

From valley of the Takhin River (Krause brothers).

Dicranum scoparium Hedw. Fund. musc., II, p. 92, pl. 8, f. 41, 42.

From Point Gustavus (Coville and Kearney, 772 in part.)

A paludal form.

Dicranum neglectum Jur. Laubm. fl., p. 47. Limpr. Laubm., I, p. 353.

D. spadiceum ZETT. Musc. pyren., p. 30.

From Port Clarence (Trelase, 1868); Sturgeon River Bay, Kodiak (Trelase, 1929); Unalaska (U. S. S. *Albatross* exped., 7a); St. George Island (U. S. S. *Albatross* exped., 57); St. Lawrence Island (Trelase, 1873, 1874 in part, 1902); St. Matthew Island (Trelase, 1886, 1888 in part, 1980); Hall Island (Trelase, 1988, 1990, 1991). New to Alaska.

Dicranum howellii Ren. & Card. in Bot. Gaz., 1889, p. 93, pl. XII, B.

From Skagway (Canby, 483); New Metlakatla (Trelease, 1906); Point Gustavus (Coville and Kearney, 755); Virgin Bay (Trelease, 2308); Sitka (Setchell, 1255; Trelease, 2360); Kodiak (Trelease, 2202, 2223, 2504); Unga (Saunders, 2294, 2295). New to Alaska.

Dicranum bonjeani De Not. apud Lisa Elencho, p. 29. Epil., p. 616.

From Sturgeon River Bay, Kodiak (Trelease, 1854).

A form nearly allied to var. *schlotthaueri* Barnes by its short and entire leaves. The type was recorded from Sitka and Nulato, teste Rothrock, by Kindberg, Mac. Cat. Can. pl., VI, Musci, p. 32.

Dicranum majus Sm. Fl. brit., III, p. 1202.

From Point Gustavus (Coville and Kearney, 754); Orca (Setchell, 1215); Sitka (Trelease, 1953; U. S. S. *Albatross* exped., 61); Hot Springs (Trelease, 1952).

Number 1215 Setchell. is a slender form.

Dicranum bergeri Bland. Musc. frond. exs., III, no. 114.

From Kodiak (Trelease, 1675*a* in part).

Dicranum molle Wils. is recorded from St. Paul Island and *D. angustifolium* Kindb. from Unalaska by Kindberg, in Mac. Cat. Can. pl., VI, Musci. *D. muhlenbeckii* has also been recorded from Alaska.

Dicranodontium longirostre Br. eur., fasc. 41, p. 2, pl. 1.

From Orca (Trelease, 1839). New to Alaska.

Dicranodontium aristatum Sch. Syn., ed. 1, p. 695.

From Hot Springs (Trelease, 1809). New to Alaska.

Slightly different from the European plant, the costa being rather less broad, but one fifth or one fourth the width of the leaf base, and having a less rough subula. *Dicranum virginicum* Aust. (*Campylopus virginicus* Lesq. & Jam.) is intermediate between the European and Alaskan forms.

Mr. Kindberg has, teste Macoun, reported from Alaska, *Campylopus schimperi* Milde.

Family SELIGERIACEÆ.

Blindia acuta Br. eur., fasc. 33-36, p. 3, pl. 1.

From Juneau (Coville and Kearney, 582); Port Wells (Trelease, 2274, 2275, 2276, 2280, 2291 in part); Hall Island (Trelease, 1881). New to Alaska.

Number 2280 is a form with long innovations, surpassing the capsule.

Blindia acuta flexipes Ren. & Card., in Rev. bryol., 1892, p. 79.

Port Wells (Trelease, 2286). New to Alaska.

Family DITRICHACEÆ.

Ceratodon purpureus Brid. Br. univ., 1, p. 480.

Very common and variable. From Juneau (Setchell, 1233; Coville and Kearney, 589; Trelease, 2175, 2177); New Metlakatla (Trelease, 2240); Wrangell (Trelease, 2316); Port Clarence (Trelease, 2106, 2107, 2108, 2109, 2110, 2111, 2112; Brewer and Coe, 671); Cape Fox (Trelease, 1934); Yakutat Bay (Trelease, 2326, 2332); Disenchantment Bay (Coville and Kearney, 1065; Brewer and Coe, 637); Muir Glacier (Trelease, 1801, 1804, 2443, 2446, 2447, 2450, 2465); Orca (Trelease, 2255, 2256); Bogoslof volcano (Coville and Kearney, 2614 in part); Sitka (Coville and Kearney, 868; Trelease, 2361; Canby, 460); Kodiak (Trelease, 2189, 2198, 2212, 2224, 2226); Douglas Island (Trelease, 2393, 2404); Prince of Wales Island (J. M. Macoun); Bering Island (J. M. Macoun); Hall Island (Trelease, 2139); St. Paul Island (Trelease, 1860, 2086); Plover Bay, Siberia (Trelease, 2097, 2531, 2532, 2536, 2537, 2546; Coville and Kearney, 1862).

Ceratodon heterophyllus Kindb. in Ott. nat., v, p. 179. Macoun, Cat. Can. pl., vi, Musci, p. 261.

From St. Paul Island (J. M. Macoun; B. W. Evermann; Trelease, 2062, 2070, 2071, 2072, 2075).

Distichium capillaceum Br. eur., fasc. 29-30, p. 4, pl. 1.

From White Pass (Trelease, 2310); Port Wells (Brewer and Coe, 653; Coville and Kearney, 1291 in part; Trelease, 2278, 2291); Orca (Trelease, 1837, 1838, 2260 in part); Yakutat Bay (Brewer and Coe, 644); Port Clarence (Trelease, 2104).

Ditrichum homallum Hpe. in Flora, 1867, p. 182.

From Kodiak (Brewer and Coe, 658 in part). New to Alaska.

A slender etiolated form, of which we find only some stems among other mosses; leaves erect, costa narrower, basilar cells broader.

Ditrichum flexicaule densum Sch. has, teste Rothrock, been recorded from Alaska by Lesquereux and James, and *D. glaucescens* Hpe., teste Macoun, from Unalaska, by Kindberg. Kindberg has also, teste Macoun, described a *Leptotrichum tomentosum* from St. Paul Island.

Family POTTIACEÆ.

POTTIA HEIMII BERINGIANA var. nov.

(Pl. xiv, fig. 2^{a-i}.)

A forma typica differt foliis brevioribus, limbo lutescente circumductis, costa breviter excurrente mucronatis reteque magis opaco valde papilloso.

From St. Matthew Island (Trelease, 2151 in part).

We found only a few stems of this moss, mixed with *Barbula brachypoda* Card. & Thér. and a *Bryum*. By the pellucid margin of the leaves, it is nearly related to *P. obtusifolia* C. Müll. (*P. heimii arctica* Lindb.), but it is easily distinguished from it by its pointed leaves. It also closely resembles *Desmatodon systylioides* Ren. & Card., from Labrador, which is probably also a *Pottia* of the same group, but it differs from this species by its ovate, shorter and proportionately wider capsule, its longer and more finely beaked lid, its shorter and more briefly acuminate leaves, and finally by its areolation formed of larger and less obscure cells.

According to J. M. Macoun *P. heimii* typica has been recorded by Kindberg from St. Matthew Island and from Bering Island.

Didymodon rubellus Br. eur., fasc. 29-30, p. 3, pl. 1.

From Juneau (Trelease, 2178); Port Wells (Trelease, 2272, 2283); Agattu Island (U. S. S. *Albatross* exped., 36); St. Matthew Island (Trelease, 2143, specimen in bad condition, and determination doubtful); Bering Island (J. M. Macoun).

Didymodon baden-powellii Kindb. Ott. Nat., v, p. 179. Macoun, Cat. Can. pl., vi, Musci, p. 262.

From St. Paul Island (J. M. Macoun).

Contrary to Kindberg's description, the leaves are entire or nearly so on the specimen we have seen. It is probable that this moss is but a form of *D. rubellus*.

TRICHOSTOMUM CUSPIDATISSIMUM sp. nov.

(Pl. XIII, fig. 4^{a-e}.)

Dioicum, elatum, compacte cespitosum, fusco-lutescens. Caulis erectus, circa 5 centim. altus, dense foliosus, rufo-tomentosus, ramis erectis numerosis. Folia siccitate crispata, madore erecto-arcuata, ad apicem caulis et ramorum congesta, fragilia (acumine sæpe effracto), e basi ovata sensim et longissime acuminata, 3-3.5 millim. longa, 0.45-0.7 lata, marginibus planis, superne inflexis, papillis prominentibus crenulatis, costa angusta, 80-90 μ basi lata, in cuspidem acutissimam longe excurrente, cellulis inferioribus rectangulis, 5-6 long. quam lat., lutescentibus, superioribus plerumque quadratis, 10-12 μ latis, opacis, grosse papillosis. Cætera desunt.

From Hall Island (Brewer and Coe, 674).

A fine species, easily distinguished from the large forms of *T. mutabile* Bruch, and its var. *cuspidatum* Limpr. (*T. cuspidatum* Sch.),

by the form of the leaves, and more particularly by its narrower costa and its upper cells which are much larger and more distinct ($10-12\ \mu$ instead of $6-8$).

TRICHOSTOMUM SITKANUM sp. nov.

(Pl. XIV, fig. 1^{a-e}.)

Dioicum? Cespites densiusculi, superne virides, intus nigrescentes, inferne terra obruti. Caulis 2-3 centim. altus, parum divisus, laxe foliosus. Folia mollia, sicca cirrato-crispata, madore patula, inferiora 2.5-3 millim. longa, superiora majora, 4-4.5 millim. longa, e basi longe subvaginante lineari-lanceolata, marginibus planis integris, costa sat valida, basi circa $110\ \mu$ lata, in mucronem lutescentem breviter excurrente, cellulis basis subvaginantibus rectangulis, hyalinis, 4-6 long. quam lat., cæteris quadrato-hexagonis, $12-14\ \mu$ latis, valde papillois. Cætera desunt.

From Sitka (Trelease, 2370).

The aspect, the form of leaves, the looser basal areolation and the upper cells more papillose, easily distinguish this plant from *T. cuspidatissimum* Card. & Thér. It is more closely connected with *T. bambergeri* Sch., but the latter has the costa shining on the back in a dry state, and the hyaline cells of the base going up along the borders of the leaf, as in *Barbula tortuosa* Web. & Mohr.

Desmatodon latifolius Br. eur., fasc. 18-20, p. 5, pl. 1.

From Unalaska (J. M. Macoun).

BARBULA BRACHYPODA sp. nov.

(Pl. XIV, figs. 3^{a-i}.)

Monoica, laxiuscule cespitosa, viridis. Caulis 5-10 millim. altus, erectus, simplex furcatusve. Folia mollia, sicca erecta, madida erecto-patentia, elliptica vel subspathulata, 2.5-3 millim. longa, 0.6-1 millim. lata, late et breviter acuminata obtusa, subobtusa acutave, marginibus e basi ad medium usque revolutis, deinde planis et pro more limbo lutescente e 3-4 seriebus cellularum composito limbatis, costa angusta (lat. $50\ \mu$), paulo sub apice evanida, rete levi, in dimidio inferiore laxissimo hyalino, cellulis rectangularibus, 66-88 μ longis, circa 22 latis, superne valde chlorophylloso, cellulis inæqualibus quadrato-rotundatis vel brevissime rectangulis, e costa ad margines sensim minoribus (majoribus 25 μ longis, 16 latis, minoribus quadratis, 14 μ latis). Flos masculus infra femineum situs. Folia perichætialia caulinis majora, acuminata, intima angustissima. Capsula in pedicello brevi, crassiusculo, pallido,

5-7 millim. longo, 0.2 millim. crasso, erecta, cylindrica, circa 2 millim. longa, operculo conico tertiam partem capsulæ æquante. Annulus latus, distinctus. Peristomium papillosum, membrana basilari brevi, dentibus semel vel bis convolutis. Sporæ leves, 12-16 μ crassæ.

From St. Matthew Island (Trelease, 2151 in part, 2166).

This species, which belongs to the section *Cuneifolia* Sch., is easily distinguished from *B. cuneifolia* Brid. by its leaves revolute below, its longer lower cells, the upper more chlorophyllose with thicker walls, its shorter seta, its broad annulus, etc.

Kindberg has established (in *Revue bryologique*, 1896, p. 22) a *B. subcuneifolia* from Alaska, which, by some characters, seems to be near to our *B. brachypoda*; but his description is so incomplete that we can neither ascertain whether this *B. subcuneifolia* is identical with the plant here described, nor, with still more reason, mention the characters which might distinguish it from the former.

BARBULA SAUNDERSII sp. nov.

(Pl. xvi, fig. 1^{a-l}.)

Dioica? laxiuscule cespitosa, olivaceo-viridis. Caulis brevis, 5-8 millim. altus, simplex vel parce divisus. Folia sicca incurvata, madida erecta vel erecto-patentia, 1.5-2 millim. longa, 0.8 lata, e basi ovata breviter acuminata, obtusa vel brevissime mucronata, marginibus e basi usque ad $\frac{2}{3}$ valde revoluta, superne concava, costa valida, tota fere longitudine æqualiter crassa (0.1 millim.), dorso valde prominente, percurrente, rarius paulisper excedente; rete levi, cellulis inferioribus laxis, rectangulis, lutescentibus, 40 μ longis, 12 latis, sequentibus quadratis, 12-13 μ latis, parietibus incrassatis, mediis et superioribus minutis, 7-8 μ latis, parum distinctis. Folia perichætialia caulinis majora, sicca erecto-incurvata, madida erecta, appressa. Capsula in pedicello purpureo, circa 10 millim. longo, siccitate sinistrorsum torto, erecta, oblonga vel subcylindrica, 1-1.25 millim. longa, operculo conico longissimo, capsulam æquante. Peristomium purpureum, papillosum, membrana basilari brevi, 30 μ alta, dentibus semel vel bis contortis. Sporæ leves, 14-16 μ crassæ.

From Hidden Glacier Inlet, Yakutat Bay (Trelease, 2514).

In habit recalls the smallest forms of *B. unguiculata* Hedw., from which it differs by the shorter and proportionately broader leaves, which are shortly ovate-lanceolate, not or hardly mucronate, etc. By the form of the leaves, it is also connected with *B. brachyphylla* Sulliv., but the latter has the stems much longer and the basal areolation of the leaves quite different.

BARBULA TRELEASEI sp. nov.

(Pl. xv, fig. 2^{a-g}.)

Dioica? dense cespitosa, lutescenti-viridis. Caulis 1-2 centim. altus, erectus, divisus. Folia siccitate crispata, madore erecto-patentia, circa 1.5 millim. longa, 0.6 lata, ovato-lanceolata, breviter acuminata, integra, marginibus e basi longe revolutis, costa valida, rubella, percurrente, basi 80 μ crassa, cellulis inferioribus rectangulis subhyalinis, levibus, mediis superioribusque minutis (diam. 8 μ), quadratis, valde papillois, parum distinctis. Folia perichætialia multo longiora et latiora, sat subito constricta, longe acuminata, madore arcuato-patula, intima subvaginantia, in dimidio inferiore hyalina. Capsula in pedicello 10-11 millim. longo, erecta, oblongo-cylindrica. Cætera desunt.

From Juneau (Trelease, 2179, 2181).

This moss has the aspect of a slender *B. fallax* Hedw.; but the texture of the leaf base, formed of rectangular subhyaline cells, clearly separates it. On the other hand, it differs from *B. vinealis* Brid. and allied forms by the much shorter leaves.

BARBULA RIGENS sp. nov.

(Pl. xv, fig. 1^{a-g}.)

Rubella, laxe cespitosa vel aliis muscis gregarie intermixta. Caulis gracilis, erectus, rigidulus, divisus, 1-2 centim. altus. Folia sicca crispata, madida erecto-patentia, stricta, breviter lanceolato-linear, 1.25-1.5 millim. longa, 0.3 lata, marginibus integris medium versus paululum revolutis, costa valida, tota fere longitudine æqualiter crassa, diam. 56 μ , biconvexa, percurrente vel in mucronem brevem excurrente, cellulis inferioribus rectangulis, hyalinis, plerumque levibus, superioribus opacis, indistinctis, quadrato-rotundatis, utraque pagina dense papillois, mediis circa 11 μ latis. Cætera ignota.

From Orca (Trelease, 2260; mixed with *Distichium capillaceum* and *Anæctangium compactum*).

This species belongs to the group of *B. rigidula* Mitt., from which it is easily distinguished by its stiff stem and leaves, the latter being shorter and very briefly acuminate and by its much more papillose areolation.

Barbula cylindrica Sch. in Hedwigia, 1873, p. 47. Syn., ed. 2, p. 208.

From Prince of Wales Island (J. M. Macoun).

Barbula fragilis Br. eur., fasc. 62-64, Suppl., pl. 4.

From Port Wells (Coville and Kearney, 1291 in part).

Barbula aciphylla Br. eur., fasc. 13-15, p. 42, pl. 26.

Yakutat Bay (Trelease, 1746 in part); Muir Glacier (Trelease, 1802). New to Alaska.

Number 1802 is a rather badly characterized form, which can be ascribed to *B. aciphylla*, but which has also some relationship with *B. ruralis* Hedw.

Barbula ruralis Hedw. Fund., II, p. 92.

From Agattu Island (U. S. S. *Albatross* Exped., 42).

A form having the facies of *B. muelleri* Bruch.

Mr. Kindberg has described from Alaska a *B. subcuneifolia* and a *B. ruralis* subsp. *alaskana*, of which we have seen no specimens.

Family GRIMMIACEÆ.

Grimmia apocarpa Hedw. Descr., I, p. 104, pl. 39.

From Juneau (Trelease, 2183); Muir Glacier (Trelease, 2432); Kodiak (Trelease, 2215); Hall Island (Trelease, 2128); St. Paul Island (Trelease, 2079).

Grimmia apocarpa gracilis Web. & Mohr, Taschenb., p. 131.

From White Pass (Trelease, 2493); Muir Glacier (Trelease, 1789, 2454); Hidden Glacier Inlet, Yakutat Bay (Trelease, 1790, 2058); Kodiak (Trelease, 1788); Hall Island (Trelease, 1880).

Grimmia apocarpa alpicola Hook. & Tayl. Muscol. brit., p. 87.

From Portage Bay (U. S. S. *Albatross* Exped.); Cape Fox (Trelease, 2386); St. Paul Island (Trelease, 2080).

A form allied to this variety by the dimension of its spores, but differing from it by its sharp pointed leaves, the upper ones ending in a hyaline point, was collected at Wrangell (Canby, 471); Cape Fox (Trelease, 2385) and at Hot Springs, near Sitka (Trelease, 2495).

Grimmia apocarpa rivularis Web. & Mohr, Taschenb., p. 129.

From Muir Glacier (Trelease, 2424, 2494); Yakutat Bay (Trelease, 2324).

Grimmia conferta Funck, Moostaschenb., p. 18, pl. 12.

From St. Paul Island (Trelease, 2470a); St. Matthew Island (Trelease, 2167).

Seems to belong to *G. conferta* by the short, hemispherical capsule, but the peristome is wanting.

Grimmia maritima Turn. Muscol. hib., p. 23, pl. 3, f. 2.

From Virgin Bay (Trelease, 2303); Port Wells (Trelease, 2279); Yakutat Bay (Trelease, 2325); Kodiak (Trelease, 2205, 2216); Agattu Island (U. S. S. *Albatross* Exped., 62). New to Alaska.

Grimmia torquata Grev. Scot. crypt. fl., iv, p. 199.

From Kodiak (Trelease, 2203, 2204).

Grimmia elatior Br. eur., fasc. 25-28, p. 17, pl. 10, *forma*?

From Yukon River (W. H. Dall). New to Alaska.

We find only some stems of this moss, with a single capsule, mixed with *Polytrichum yukonense* Card. & Thér., and their determination remains rather doubtful.

Kindberg has recorded from Alaska *G. agassizii* Sulliv. and Lesq. and from Unalaska *G. crassinervis* C. Müll.

Rhacomitrium patens Hüb. Muscol. germ., p. 198.

From Unalaska (J. M. Macoun).

RHACOMITRIUM SUDETICUM ALASKANUM var. nov.

Forma minor, habitu varietati *tenellum* Boul. similis, sed foliis subepiliferis vel apiculo hyalino omnino destitutis costaque validiore distincta.

Hidden Glacier Inlet, Yakutat Bay (Trelease, 2508 in part).

Rhacomitrium aciculare Brid. Mant., p. 80.

From Juneau (Coville and Kearney, 573); Kodiak (Trelease, 1849).

Rhacomitrium nevii Wats. Bot. Calif., II, p. 381.

From Juneau (Trelease, 2174); Atka Island (J. M. Macoun).

Rhacomitrium fasciculare Brid. Mant., p. 80.

From Portage Bay (U. S. S. *Albatross* Exped.); Yakutat Bay (Trelease, 1785, 2322); Cape Fox (Trelease, 2377); Muir Glacier (Trelease, 1781, 2455); Kodiak (Trelease, 1786, 2193); Sitka (U. S. S. *Albatross* Exped., 47); Hot Springs (Trelease, 1769, 2346, 2350).

Number 2322 is a forma *minor*.

Rhacomitrium tenuinerve Kindb. Rev. bryol., 1896, p. 19.

R. fasciculare var. *haplocladon* KINDB. Not. on Can. bryol., 1893.

R. microcarpum var. *palmeri* KINDB. apud Macoun, Cat. Can. pl., VI, Musci, p. 267.

R. palmeri KINDB. Rev. bryol., 1896, p. 19.

From St. Paul Island (J. M. Macoun); St. Matthew Island (Trelease, 1885, 2169); Pribilof Islands (Palmer, 1891).

R. tenuinerve and *palmeri* of Kindberg surely constitute but one species, which differs from *R. fasciculare* Brid. principally by its weak, flat costa, disappearing far from the point. Kindberg is mistaken in attributing to *R. palmeri* a percurrent or subexcurrent costa.

Proc. Wash. Acad. Sci., July, 1902.

On the original specimen collected by Palmer, and which Kindberg himself formerly communicated to us, the costa has exactly the same length and the same structure as in *R. tenuinerve*. The latter is a form with long simple or hardly branched stems, whereas *R. palmeri* is a shorter and more ramulose form.

RHACOMITRIUM CYCLODICTYON sp. nov.

(Plate xv, fig. 3^{a-g}.)

Dioicum? parvum, dense cespitosum, atrofusum. Caulis depressus, ramosissimus, ramis confertis, erectis, brevibus, 3-5 millim. longis. Folia siccitate suberecta vix flexuosa, madore erecto-patentia, 1.25 millim. longa, 0.5 lata, ovato-lanceolata, mutica, integerrima, inferne marginibus revoluta, costa sat tenui, 35-40 μ crassa, paulo sub apice evanida, rete subæquali, cellulis infimis juxta costam paucis rectangulis vel sublinearibus, haud sinuosis, omnibus cæteris rotundatis vel brevissime ovatis, 8-12 μ latis, parietibus incrassatis, levibus sed valde convexis, ita ut papillas maximas æmulent. Folia perichætalia multo majora, e basi subvaginante sensim et longe acuminata, madore erecta. Capsula in pedicello brevi, purpureo, demum nigricante, siccitate sinistrorsum torto, 5 millim. longo, erecta, anguste cylindrica, 1.5 millim. longa, 0.3 crassa. Sporæ minute granulosæ, diam. 16-17 μ . Cætera ignota.

From Muir Glacier (Trelease, 2431).

A most remarkable species, which cannot be mistaken for any other on account of its characteristic areolation very different from that of all known species of the genus *Rhacomitrium*.

Rhacomitrium heterostichum Brid. Mant., p. 79.

From Hot Springs (Trelease, 1773, 1774); Kodiak (Trelease, 1776); Orca (Trelease, 1961 in part).

Rhacomitrium heterostichum affine (Schleich.) Card. and Thér.

From Unalaska (Trelease, 2296).

Rhacomitrium lanuginosum Brid. Mant., p. 79.

From Juneau (Setchell, 1240); New Metlakatla (Trelease, 1949); Virgin Bay (Trelease, 1775); Sitka (Trelease, 1772); Kodiak (Brewer and Coe, 655); Hall Island (Trelease, 1777, 1778); St. Matthew Island (Trelease, 1856).

Number 1949 is the form *falcata* Boul. Numbers 1777, 1778 and 1856 belong to a form *stricta*. (Branches rigid when dry, subdistichous; leaves erect-appressed.)

Rhacomitrium canescens Brid. Mant., p. 78.

From Orca (Setchell, 1211); Muir Glacier (Trelease, 1764b, 1766, 1767, 1768, 2423, 2429, 2456); Hidden Glacier Inlet, Yakutat Bay (Trelease, 1780 in part); Disenchantment Bay (Trelease, 1779 in part); Unalaska (J. M. Macoun).

Rhacomitrium canescens ericoides Br. eur., fasc. 25-28, p. 12, pl. 8, fig. 7.

From Yakutat (Trelease, 1794); Disenchantment Bay (Trelease, 1065 in part, 1770, 1779 in part, 2505, 2506; Brewer and Coe, 639, 640); Hubbard Glacier (Coville and Kearney, 1071, 1073 in part, 1065 in part); Hidden Glacier Inlet (Trelease, 1771, 1780 in part); Russell Fiord (Coville and Kearney, 995); Muir Glacier (Trelease, 1764, 1765, 2418, 2430, 2464); Muir Inlet (Coville and Kearney, 636); Point Gustavus (Coville and Kearney, 776).

Numbers Trelease, 1780 in part, and Coville and Kearney, 1073 in part, constitute a form *epilosa* or *subepilosa*.

Coscinodon pulvinatus Spreng. has, teste M. W. Harrington, been recorded from Alaska by Lesquereux and James.

Family ORTHOTRICHACEÆ.

Amphoridium lapponicum Sch. Syn., ed. 1, p. 247.

From Orca, 1,200 ft. (Trelease, 2246); Port Wells (Brewer and Coe, 651); Yakutat Bay (Trelease, 2323).

Amphoridium mougeotii Sch. Syn., ed. 1, p. 248.

From Juneau (Coville and Kearney, 577). New to Alaska.

Ulota drummondii Brid. Bryol. univ., 1, p. 299.

From Kodiak (Trelease, 2209); Unga (Saunders, 2292).

Ulota phyllantha Brid. Mant., p. 113.

From Bailey Harbor (U. S. S. *Albatross* Exped.); Cape Fox (Trelease, 2837); Yakutat Bay (Trelease, 2337a); Unalaska (Trelease, 2297); Kodiak (Trelease, 2210, 2227); Baranof Island (Trelease, 2348); St. Paul Island (Trelease, 2078, 2470 in part).

Numbers 2348 in part, 2470, 2337a and 2297 belong to the form called *U. maritima* by C. Müller and Kindberg.

ULOTA ALASKANA sp. nov.

(Pl. xv, fig. 4^{a-g}.)

Ex affinitate *U. crispæ* Brid., a qua primo visu differt magnitudine, habitu robustiore (caule 2-4 centim. alto, valde ramoso), pedicello longiore (4-6 millim.), foliis inferne angustius hyalino-limbatis (4-5

seriebus cellularum), sporis majoribus, diam. 19–23 μ , et praesertim capsula siccitate ore dilatata, nunquam infra orificium constricta.

From Wrangell (Coville and Kearney, 407); Point Gustavus (Coville and Kearney, 774); New Metlakatla (Trelease, 2239); Yakutat Bay (Trelease, 2337); Virgin Bay (Trelease, 2499); Hot Springs (Trelease, 2347).

By the shape of its capsule, dilated at the mouth, this species is very distinct from *U. bruchii* Hornsch. and *U. intermedia* Sch. It cannot be, either, mistaken for *U. connectens* Kindb., which, according to the author, has a short, hardly emergent seta. *U. camptopoda* Kindb. would appear, according to the description, nearer to *U. alaskana*, but as Kindberg has recently joined it to his *U. connectens*, we need not take it into account. Besides, he gave it the aspect of *U. crispula* Bruch, which does not at all agree with our *U. alaskana*, characterized by its great size and the length of its seta.

ULOTA CRISPA SUBCALVESCENS var. nov.

Capsula brevis, madida ut in *U. crispula*, sed sicca et vacua sub ore constricta ut in *U. crispa*. Calyptra tantum apice pilosa.

Baranof Island (Trelease, 2348 in part).

Two small tufts, mixed with *U. phyllantha* Brid.

Ulotia barclayi Mitt. Journ. Linn. Soc., VIII, p. 26.

From Cape Fox (Trelease, 2384). First discovered at Sitka by Barclay.

Orthotrichum arcticum Sch. Br. eur. Suppl., pl. 5, et Syn., ed. 2, p. 310.

From St. Paul Island (Trelease, 2081, 2470). New to Alaska.

ORTHOTRICHUM FENESTRATUM sp. nov.

(Pl. XVI, fig. 2^{a-n}.)

Monoicum, laxiuscule pulvinatum, atroviride, intus nigricans. Caulis pluries divisus, 1–1.5 centim. altus. Folia erecta, sicca imbricata, madida vix patentia, media 3.5 millim. longa, 0.75–1 lata, superiora majora, lanceolata vel ovato-lanceolata, acuta, marginibus integris usque apicem versus revolutis, costa angusta fuscescente sub apice evanida, cellulis inferioribus subhyalinis, rectangulis, 2–4 long. quam lat., margines versus brevioribus, parietibus sinuosis, mediis et superioribus inaequalibus, rotundatis vel breviter ovatis, diam. 9–12 μ , parietibus incrassatis. Flos masculus sub femineo sessilis, foliis perigonalibus brevibus, apice rotundatis, ecostatis vel obsolete costatis, para-

physibus filiformibus. Capsula in pedicello brevi, 1-2 millim. longo exserta, pallide lutea, ovato-pyriformis, sicca subglobosa basi abrupte constricta, madida sensim collo longo in pedicello defluente attenuata, levis vel siccitate vix plicatula, cum collo 3 millim. longa, 1.5 crassa, stomatibus emersis, fasciis subindistinctis, cellulis paululum flavidioribus et magis incrassatis compositis, operculo depresso, longirostro. Calyptra conico-campanulata, plicatula, pilis paucis albidis ornata, apice brunnea. Vaginula nuda. Peristomium, ut videtur, simplex, dentibus 8 bigeminatis, pallide luteis, granulosus, siccitate erectis vel patentibus, in dimidio superiore cancellatis et cribroso-perforatis. Sporæ pro genere maximæ, diam. 24-28 μ , fusæ, papillose.

From St. Paul Island (J. M. Macoun).

This moss was distributed as *O. anomalum* Hedw., but it bears no resemblance to that species. It is allied to *O. cribrorum* C. Müll. from the Chukchi peninsula, Siberia, chiefly by the shape of the capsule and the structure of the peristomial teeth, but it differs from it by its larger size and the leaf-areolation, composed of less incrassate and less papillose cells. In *O. cribrorum* the leaf-cells are strongly incrassate and coarsely papillose from the base.

Orthotrichum speciosum Nees v. Esenb. in Sturm, Deutsch. Fl., fasc. 17.

From Point Gustavus (Coville and Kearney, 791).

A doubtful specimen also from Wrangell (Trelease, 2314 in part).

Orthotrichum pulchellum Brunt. in Engl. bot., pl. 1787.

Prince of Wales Island (J. M. Macoun); Disenchantment Bay (Trelease, 2513); Wrangell (Trelease, 2314 in part); Sitka (Trelease, 2353).

Family ENCALYPTACEÆ.

Encalypta vulgaris Hedw. Sp. musc., p. 60.

From Juneau (Setchell, 1233 in part).

E. commutata Nees & Hornsch., *E. rhabdocarpa* Schw., *E. macounii* Aust. and *E. alaskana* Kindb. have been reported from Alaska.

Family TETRAPHIDACEÆ.

Tetraphis geniculata Girg. mss. Milde in Bot. Zeit., 1865, p. 155.

From Port Etches (J. M. Macoun); Sitka (J. M. Macoun; Trelease, 2352, 2362, 2363); Virgin Bay (Trelease, 2306); Orca (Trelease, 2263); Douglas Island (Trelease, 2394, 2401, 2413).

Tetraphis pellucida Hedw. has also been reported from Sitka.

Family SPLACHNACEÆ.

Dissodon splachnoides Grev. & Arn. in Mem. Wern. Soc., v, p. 468, pl. 15.

From Port Wells (Coville and Kearney, 1292, 1295).

Tayloria serrata Br. eur., fasc. 23-24, p. 6, pl. 1.

From St. Paul Island (J. M. Macoun).

Tayloria tenuis Sch. Syn., ed. 2, p. 360.

From Yakutat Bay (Trelease, 2321, 2474); Virgin Bay (Trelease, 2475); Douglas Island (Trelease, 2471, 2472). New to Alaska.

Tetraplodon mnioides Br. eur., fasc. 23-24, p. 5, pl. 2.

From Wrangell (Coville and Kearney, 432); Yakutat Bay (Trelease, 2473); New Metlakatla (Trelease, 2477); Kodiak (Trelease, 2502); Popof Island (Saunders, 2479); Hall Island (Trelease, 2481); St. Matthew Island (Trelease, 2482; Coville and Kearney, 2114); St. Paul Island (J. M. Macoun).

Tetraplodon mnioides cavifolius Sch. Syn., ed. 1, p. 304.

From Port Clarence (Trelease, 2480); St. Matthew Island (Brewer and Coe, 682, 683).

Tetraplodon urceolatus Br. eur., fasc. 23-24, p. 7, pl. 3.

From St. Matthew Island (J. M. Macoun).

Splachnum sphæricum Linn. fil. apud Swartz, Method. musc., p. 33, pl. 1, f. 1.

From Wrangell (Coville and Kearney, 431); Sitka (Trelease, 2473, 2478); Yes Bay (Gorman, 129½); Unalaska (Trelease, 2298, 2476).

Splachnum wormskjoldii Hornem. in Fl. dan., x, fasc. 28, p. 8, pl. 1659.

From St. George Island (J. M. Macoun).

Splachnum luteum Linn. Fl. suec., p. 954.

From Koyukuk River (F. C. Schrader, 1899). New to Alaska.

S. vasculosum Linn. has, teste Bischoff, been reported from Sitka by Lesquereux and James.

Family FUNARIACEÆ.

ENTOSTHODON SPATHULIFOLIUS sp. nov.

(Pl. xvii, fig. 1^{a-i}.)

Polygamus, densiuscule cespitosus, superne viridis, intus fuscescens. Caulis erectus, 10-15 millim. altus, radiculosus, ramosus, ramis gracilibus claviformibus, sub perichætiis nascentibus. Folia mollia, sicca erecto-appressa, interdum subcrispata, madida patula, inferiora minuta,

ovata, superiora majora, 1.5–2 millim. longa, 1 lata, oblongo-spathulata, integra, obtusa subapiculatave, marginibus planis; basin versus interdum subrevolutis, costa tenui, attenuata, plus minus longe ab apice evanida, rete laxo, cellulis basilaribus subrectangulis, 60–80 μ longis, 30 μ latis, mediis superioribusque brevioribus, rectangulis, quadratis vel subhexagonis, long. 25–30 μ , lat. 20 μ , marginalibus sæpe longioribus angustioribusque, lutescentibus, 1–2-seriatis. Flores polygami, terminales, nunc unisexuales, nunc synoici; flores masculi in extremitate ramorum nascentes. Capsula in pedicello pallide luteo, 6–9 millim. longo, flexuoso, oblique erecta, pyriformis, collo distincto attenuata, operculo convexo, mamillato. Calyptra brevis, cucullata, haud vel vix inflata. Cætera ignota.

From St. Paul Island (Trelease, 2067, 2074).

A remarkable species, very distinct from all the *Entosthodon* of Europe and North America by its polygamous inflorescence, its leaves shortly spatulate, obtuse or subapiculate, and its calyptra hardly swelling. It is much to be regretted that the too immature capsules do not show the peristome, annulus and spores.

Funaria hygrometrica Sibth. Fl. oxon., p. 288.

From Alaska, sine loco (W. H. Evans); Douglas Island (Trelease, 2402).

Funaria hygrometrica calvescens Br. eur., fasc. 11, p. 8, pl. 3.

From Fort Yukon (F. C. Schrader).

Family BARTRAMIACEÆ.

Bartramia ithyphylla Brid. Muscol. recent., II, part III, p. 132, pl. 1, f. 6.

From Port Clarence (Trelease, without number); Disenchantment Bay (Trelease, 2520); Orca, 1,400 ft. (Trelease, 2242, 2483 in part); Kodiak (Trelease, 2488); Hall Island (Trelease, 2126); St. Paul Island (J. M. Macoun).

Bartramia ithyphylla strigosa Wahlenb. Fl. lapp., p. 362.

Bartramia ithyphylla var. *rigidula* SCH. Syn., ed. 2, p. 510.

Bartramia ithyphylla subsp. *rigidula* KINDB. Eur. and N. Amer. Br., p. 323.

From St. Matthew Island (Trelease, 2147, 2152, 2164; Coville and Kearney, 2181; Brewer and Coe, 679, 681).

Bartramia pomiformis Hedw. Sp. musc., p. 164.

From Yes Bay (Gorman, 183); Juneau (Coville and Kearney, 574, 577 in part); Orca (Setchell, 1216; Trelease, 2243, 2483); Virgin Bay (Trelease, 2485); Douglas Island (Trelease, 2408).

Bartramia oederi Sw. in Schrad. Journ. bot., II, p. 181, pl. 3 B, f. 5.

From Juneau (Coville and Kearney, 572); Port Wells (Coville and Kearney, 1291).

B. menziesii Turn., *B. subulata* Br. eur., *B. breviseta* Lindb. and *B. circinnulata* C. Müll & Kindb. have been reported to occur in Alaska and the islands of Bering Sea.

Conostomum boreale Sw. in Schrad. Journ. bot., I, III, p. 26, pl. 5.

From Port Wells (Trelease, 2281, 2486, 2487); Orca (Trelease, 2484); Hall Island (Trelease, 2137, 2138).

Philonotis macounii Lesq. & Jam. Man., p. 208.

From Juneau (Canby, 487; Coville and Kearney, 585); Muir Glacier (Trelease, 1783 in part; specimen in bad state, and rather doubtful). New to Alaska.

Philonotis fontana Brid. Bryol. univ., II, p. 18.

From Muir Glacier (Trelease, 1799, 1800, 1803, 1899, 1910, 2437, 2438, 2444, 2451; Coville and Kearney, 637 in part); Point Gustavus (Saunders, 1798; Coville and Kearney, 760); Hidden Glacier Inlet, Yakutat Bay (Trelease, 1811, 1812); Disenchantment Bay (Trelease, 1823, 1827, 2509, 2510; Coville and Kearney, 1073); head of Russell Fiord (Coville and Kearney, 961); Kukak Bay (Saunders, 1855); Kodiak (Trelease, 1789, 1843, 1852, 1928, 2190?; Brewer and Coe, 657); Unalaska (Coville and Kearney, 1743, 1744); Popof Island (Saunders, 1859; Trevor Kincaid); St. Matthew Island (Trelease, 1894); Attu Island (J. M. Macoun); St. Paul Island (J. M. Macoun).

A very variable plant. The numbers 1789, 1843, 1852, 1855 and 1928 of Trelase, as well as numbers 1743 and 1744 of Coville and Kearney, are forms more or less resembling var. *cæspitosa*. A specimen gathered on Unalaska Island by Mr. J. M. Macoun is a form remarkable by its subacute, distinctly nerved perigonal leaves, and by its stem-leaves, which are hardly revolute on the borders and possess a loose areolation, characters that place it near the var. *cæspitosa*, but it differs from the latter by its stems provided with much more numerous fasciculate branches. On the other hand, it is closely connected with the form that Kindberg named *P. acutiflora*, but in the latter the stem-leaves are strongly revolute. Number 1812 of Trelase, as well as the specimens from Kukak Bay and St. Paul Island, constitute a heterophyllous deformation, with upper leaves often obtuse or subobtuse. The var. *serrata* Kindb. (Attu Island, teste Macoun) does not appear to be distinguishable from the type.

Philonotis fontana cæspitosa Sch. Syn., ed. 2, p. 520.

Yakutat Bay (Trelease, 1819).

Philonotis capillaris Lindb. in Hedwigia, 1867, p. 40.

From Kodiak (Trelease, 1841). New to Alaska.

This sterile specimen has, it is true, the aspect, size and areolation of the European *P. capillaris*, but it differs from it by the leaves revolute on the borders from the base for two-thirds of their length. However, it seems impossible to ascribe it to another species. Moreover, according to Mr. Dixon (Handbook, p. 297), *P. capillaris* may have the leaves more or less revolute; this character would then be only more marked on the plant from Kodiak.

Kindberg has indicated from Alaska *P. vancouveriensis* Kindb. and *P. seriata* Mitt.

Family MEESEACEÆ.

Meesea uliginosa Hedw., Descr., 1, p. 1, pl. 1, 2.

From Port Wells (Trelease, 2284, 2287); Popof Island (Saunders, without number); St. Matthew Island (Trelease, 1857, 2142).

Meesea tschuctschica C. Müll. in Bot. Centralbl., 1883, nos. 41-43.
(Pl. xxiii, fig. 3^{a-e}.)

From St. Matthew Island (Trelease, 1893 in part). New to Alaska.

This specimen agrees exactly with a scrap of the type kindly communicated by the Royal botanical museum of Berlin, but in the latter the leaves are more crowded, giving to the plant a still more robust aspect. *M. tschuctschica* differs from *M. triquetra* Angstr. by its larger size and broader leaf-cells.

Paludella squarrosa Brid., Spec. musc., iii, p. 74.

From St. Matthew Island (Trelease, 1893 in part).

Family BRYACEÆ.

Leptobryum pyriforme Sch., Coroll., p. 64.

From Alaska, sine loco (A. Kellogg); Orca (Trelease, 2254, 2257); Bering Island (J. M. Macoun).

Webera cruda Bruch in Hüb. Musc. germ., p. 425.

From Juneau (Coville and Kearney, 578); White Pass, 3,000 ft. (Trelease, 2311, 2312); Orca (Trelease, 1840); Kodiak (Trelease, 2201); Unalaska (J. M. Macoun); St. Paul Island (J. M. Macoun).

Webera nutans Hedw. Descr., 1, p. 9, pl. 4.

From Juneau (Trelease, 2182; Brewer and Coc, 696); Port Clarence (Trelease, 2105); Cape Fox (Trelease, 2378); New Metlakatla (Trelease, 2241); Yakutat Bay (Trelease, 2318, 2333); Orca (Tre-

lease, 2244); Sitka (Trelease, 2354, 2372); Kodiak (Trelease, 2208, 2223); Hall Island (Trelease, 2141); Douglas Island (Trelease, 2390, 2395, 2396, 2390, 2403); St. Lawrence Island (Trelease, 2122, 2123); St. Matthew Island (Coville and Kearney, 2124); Plover Bay, Siberia (Trelease, 2533, 2534, 2538; Brewer and Coe, 668; J. M. Macoun; L. J. Cole).

Webera nutans caespitosa Hüb., *Musc. germ.*, p. 429.

From Virgin Bay (Trelease, 2307); Kodiak (Trelease, 2188); Douglas Island (Trelease, 2397, 2399, 2412).

Webera nutans bicolor Hüb., *loc. cit.*

From St. Paul Island (Trelease, 2061); St. George Island (J. M. Macoun).

Webera nutans strangulata Sch. Coroll., p. 66.

From Yakutat Bay (Trelease, 2320).

Webera cucullata Sch. Coroll., p. 66.

From Egg Island in Disenchantment Bay (Coville and Kearney, 1016 in part); Port Wells (Trelease, 2269); St. Paul Island (J. M. Macoun).

WEBERA PSEUDOGRACILIS sp. nov.

(Pl. xvii, fig. 2^{a-g}.)

Dioica, laxe cespitosa, lutescenti-viridis. Caulis brevis, 4-5 millim. altus, simplex vel parce divisus. Folia æqualiter conferta, parva, sicca imbricata, madida erecto-patentia, 1-1.5 millim. longa, 0.4-0.6 lata, nec carinata, nec decurrentia, inferiora breviter ovata vel ovato-lanceolata, superiora lineari-lanceolata, acuta, apice denticulata, marginibus e basi usque ad $\frac{2}{3}$ leniter reflexis, costa sat valida, 56 μ basi crassa, percurrente vel subpercurrente, demum rubente, rete denso, cellulis inferioribus rectangulis, rubellis, mediis linearibus, 48-64 μ longis, 8 μ latis, superioribus anguste linearibus, flexuosis, parietibus valde incrassatis, marginalibus angustioribus longioribusque. Folia perichætialia caulinis minora. Capsula in pedicello flexuoso, rubello, circa 2 centim. longo pendula, pallida, obovata, cum operculo convexo, mamillato, 3 millim. longa. Flos masculus terminalis subdiscoideus. Cætera ignota.

From Muir Glacier (Trelease, 2419, 2425, 2427, 2428, 2463.)

Aspect of *Webera gracilis* De Not., but the areolation is different and much closer; it is distinguished, on the other hand, from *Webera drummondii* Lesq. & Jam. by its leaves which are more crowded on the whole stem, and not carinate-concave, and its capsule hanging and with a mamillary lid.

Webera annotina Bruch in Hüb. Muscol. germ., p. 431.

From New Metlakatla (Coville and Kearney, 370); Kodiak (Trelease, 2222); Unalaska (Trelease, 2300); Hall Island (Trelease, 2140). New to Alaska.

Webera proligera Kindb. Enum. br. dovr., Append., no. 309.

From Kodiak (Trelease, 2221).

This species has also recently been discovered in the Yukon territory by R. S. Williams, and in Minnesota by J. M. Holzinger.

Webera albicans Sch. Coroll., p. 67.

From Juneau (Trelease, 2172); Port Etches (J. M. Macoun); Sitka (Trelease, 1810); Muir Glacier (Trelease, 1783 in part, 2433, 2440, 2458; Coville and Kearney, 637 in part); Yakutat Bay (Trelease, 1822 in part).

Webera albicans glacialis Sch. loc. cit.

From Juneau (Coville and Kearney, 580); Hidden Glacier Inlet, Yakutat Bay (Trelease, 1813, 1817); Hall Island (Trelease, 1883 in part).

The following species have been recorded from Alaska and the islands of Bering Sea: *W. polymorpha* Sch., *W. crudoides* Sull. & Lesq., *W. cucullatiformis* Kindb., *W. drummondii* Lesq. & Jam.

Genus **BRYUM**.¹

Subgenus **CLADODIUM** Sch.

BRYUM ATELEOSTOMUM Philibert sp. nov.

(Pl. XIX, fig. 1^{a-f}.)

Polygamum, viride, densissime cespitosum, radiculis numerosis arcte intertextum. Caulis ramosus, 1-1.5 centim. altus. Folia erecto-imbricata, ad extremitatem caulis et ramorum in comam congesta, 1.2-1.4 millim. longa, 0.5 lata, ovato-lanceolata, costa excurrente cuspidata, basi haud decurrentia, marginibus limbatis integris, nunc planis, nunc plus minus longe revolutis, costa tenui, 50-55 μ basi crassa, rete densiusculo, cellulis inferioribus quadratis vel rectangulis, 25-50 μ longis, 20-25 latis, cæteris oblongo- vel ovato-hexagonis, 28-45 μ longis, 12-13 latis. Capsula in pedicello rubello breviusculo, circa 1.5 centim. longo, nutans vel pendula, ovata, collo brevi instructa, 2 millim. longa, operculo depresso convexo, mamillato. Exostomii dentes pallide lutei, concolores, articulis 20, regularibus. Endostomium vix evolu-

¹We are indebted to Mons. Philibert for the determinations of nearly all the species of this genus. He has himself described three of the new species in the *Revue bryologique* for 1900 and 1901.

tum, sæpius e membrana uniformi, tenui, fugaci compositum. Sporæ 18–20 μ crassæ.

From Kukak Bay (Coville and Kearney, 1516).

Bryum stenotrichum C. Müll. in Flora, 1887, p. 219.

From Dyea Valley, Chilkoot and Taiyasanka (Krause brothers, 1882).

Bryum inclinatum Br. eur., fasc. 6–9, p. 17, pl. 3.

From Juneau (Coville and Kearney, 571); Port Wells (Brewer and Coe, 652; Trelease, 2266, 2267); Cape Fox (Trelease, 2381); Yakutat Bay (Trelease, 2319); Disenchantment Bay (Trelease, 2522a); Egg Island (Coville and Kearney, 1016); Muir Glacier (Trelease, 2421); Kukak Bay (Coville and Kearney, 1536, 1590, 1602); Kodiak (Brewer and Coe, 656; Trelease, 2184, 2196, 2199, 2200, 2228; J. M. Macoun); Unalaska (B. W. Evermann); Agattu Island (U. S. S. *Albatross* Exped., 26, 30, 33); St. Paul Island (Trelease, 2065, 2068; J. M. Macoun); Hall Island (Coville and Kearney, 2056); Douglas Island (Trelease, 2400); St. Matthew Island (Trelease, 2144; Brewer and Coe, 680); Plover Bay, Siberia (Trelease, 2098, 2540, 2541; J. M. Macoun).

Very numerous forms, of which some are rather doubtful, on account of the imperfect state of the capsules.

BRYUM TRELEASEI Philib. sp. nov.

(Pl. xx, fig. 1^{a–g}.)

From St. Matthew Island (Trelease, 1890 in part, mixed with *Hypnum revolvens*).

We do no more than figure this species and the two following, which have been carefully described by Mons. Philibert, in the *Revue bryologique*, 1901, pp. 33–35, pl. viii, fig. 1.

BRYUM AGATTUENSE Philib. sp. nov.

(Pl. xx, fig. 2^{a–h}.)

Described in Rev. bryol., 1901, p. 35, pl. viii, fig. 2.

From Agattu Island (U. S. S. *Albatross* Exped., 24, 27).

BRYUM MUCRONIGERUM Philib. sp. nov.

(Pl. xvii, fig. 3^{a–f}.)

Described in Rev. bryol., 1900, p. 91, pl. v, fig. 3.

From Port Wells (Trelease, 2270; Coville and Kearney, 1296); Cape Fox (Trelease, 2379); St. Paul Island (Trelease, 2063, 2064, 2066).

Mons. Philibert describes the lid of this species as "convexe, peu saillant et obtus." We have seen it mamillate.

Subgenus *EUBRYUM* Lindb.

Bryum bimum Schreb. Spic. flor. lips., p. 83.

From Muir Glacier (Trelease, 2460). New to Alaska.

A short form.

Bryum pallescens Schleich. Crypt. exsicc. helv., no. 28.

From Indian Camp in Yakutat Bay (Brewer and Coe, 650); Disenchantment Bay (Brewer and Coe, 633); Hubbard Glacier (Coville and Kearney, 1070); Egg Island (Coville and Kearney, 1085); Muir Glacier (Trelease, 1791, 2420, 2435, 2436, 2439, 2457); Port Wells (Trelease, 2264); Douglas Island (Trelease, 2398); Agattu Island (U. S. S. *Albatross* Exped., 28, 32); St. Matthew Island (Trelease, 2145); St. Paul Island (Coville and Kearney, 1835; Trelease, 2068); Plover Bay, Siberia (Trelease, 2060, 2096, 2535).

Several forms. Some specimens are rather doubtful because of the bad state of the capsules.

BRYUM CYLINDRICO-ARCUATUM Philib. sp. nov.

(Pl. xviii, fig. 2^{a-g}.)

Monoicum (fide Philibert), viride, densiuscule cespitosum, radiculis numerosis intertextum. Caulis erectus, 1-2 centim. altus, superne ramos graciles emittens. Folia ad basin caulis et ramorum minuta, remota, superiora majora, in comam congesta, circa 2 millim. longa, 1-1.2 lata, sicca erecta subflexuosa, madida patentia patulave, e basi paululum decurrente ovato-vel oblongo-lanceolata, late breviterque acuminata, mucronata, marginibus integris haud limbatis parce revolutis, costa basi $50\ \mu$ crassa superne attenuata breviter excurrente, rete densiusculo, cellulis inferioribus laxioribus rectangulis, $55-85\ \mu$ longis, 22 latis, mediis oblongo-hexagonis, long. $28-56\ \mu$, lat. 14, superioribus minoribus brevioribusque. Flos masculus terminalis, 25-30 antheridiis. Capsula in pedicello rubello flexuoso, 2 centim. longo, apice curvato, nutans vel pendula, anguste cylindrica, arcuata, longicollis, operculo obtuse conico. Peristomii dentes longissimi, basi rubri. Endostomium valde perfectum, ciliis appendiculatis. Sporae leves, diam. $12\ \mu$.

From Kodiak (Trelease, 2186).

Bryum argenteum Linn. Sp. plant., p. 1120.

From Bogoslof volcano (Coville and Kearney, 2614 in part); St. Paul Island (Trelease, 1513, 2090; J. M. Macoun).

Number 2090 is a form near var. *majus* Br. eur.

BRYUM LAURENTIANUM sp. nov.

(Pl. XIX, fig. 3^{a-g}.)

Elatum, densissime cespitosum, lutescenti-viride. Caulis 3-4 centim. altus, radiculosus, laxiuscule foliosus, ramis numerosis erectis subclavatis. Folia sicca et madida erecto-imbricata, ovato-vel oblongo-lanceolata, circa 1.5 millim. longa, 0.75 lata, acute acuminata, marginibus planis inferne integris, superne distincte denticulatis, costa valida demum fuscescente, basi 80-100 μ crassa, sensim attenuata et sub apice evanida, cellulis basilaribus rectangulis, mediis superioribusque rectangulis vel oblongo-subhexagonis, long. 40-75 μ , lat. 14-17, marginalibus 4-5 seriatis, longioribus angustioribusque, linearibus, parietibus paululum crassioribus, limbum parum distinctum efformantibus. Cætera ignota.

From St. Lawrence Island (Trelease, 1871).

This species, which seems to belong to the group of *B. alpinum* Huds., is chiefly characterized by its more acuminate and distinctly denticulate leaves, and by its nerve disappearing below the apex.

BRYUM LEPTODICTYON Philib. sp. nov.

(Pl. XVIII, fig. 3^{a-f}.)

Dioicum, gregarium, pallide vel lutescenti-viride. Caulis erectus, simplex, 4-6 millim. altus. Folia sicca imbricata, madida erecta, inferiora minora, ascendendo majora, anguste lanceolata, sublinearia, sensim longeque acuminata, 1-1.8 millim. longa, 0.35 lata, basi haud decurrente, marginibus planis inferne integris, superne minute denticulatis, costa angusta, basi 55 μ crassa, percurrente, rete perfecte weberaceo, cellulis uniformibus linearibus, mediis 45-60 μ longis, 5-6 latis. Capsula in pedicello rubello flexuoso, 1.5-2 centim. longo, abrupte pendula, oblonga, parva, 2 millim. longa, 0.8-0.9 crassa, pallida, collo brevi attenuata, operculo conico apiculato. Peristomium perfectum, dentibus basi rubris, ciliis appendiculatis. Sporæ leves, diam. 9-12 μ .

From Hidden Glacier in Russell Fiord (Coville and Kearney, 1964).

Species very distinct, having quite the facies and areolation of a *Webera* with the peristome of *Bryum*.

BRYUM HETEROGYNUM Philib. sp. nov.

(Pl. XIX, fig. 2^{a-g}.)

Dioicum. Cespites humiles, intense rubri, ætate vinosi, basi terra obruti. Caulis erectus, radiculosus, ramosus, 5-12 mill. altus. Folia sicca erecta, madida erecto-patentia, ovato-lanceolata, 1.5 millim. longa,

0.5–0.6 lata, sat longe acuminata costaque excurrente cuspidata, apice parce et acute denticulata, marginibus sæpius limbatis, limbo inferne angusto, plano, superne crassiore, distincto, interdum subreflexo, rarius deficiente, costa angusta, basi 50–55 μ crassa, sensim attenuata, cellulis inferioribus rectangulis, 50–65 μ longis, 17–22 latis, mediis oblongo-hexagonis, 45–55 μ longis, 13 latis, marginalibus angustioribus linearibus. Capsula in pedicello rubello, 2.5–3 centim. longo, nutans vel pendula, ovato-pyriformis, collo attenuato instructa, 3–4 millim. longa, operculo convexo. Exostomii dentes pallide ferruginei. Endostomium perfectum, ciliis appendiculatis. Planta mascula brevis, gemmiformis, cespites distinctos efformans, foliis breviter ovato-cuspidatis.

From Muir Glacier (Trelease, 2426, 2434, 2441, 2461, 2462); Hidden Glacier Inlet in Yakutat Bay (Trelease, 2518).

Bryum acutiusculum C. Müll. in Flora, 1887, p. 220.

From Chilkoot (Krause brothers).

Bryum cæspitium Linn. Sp. plant., p. 1121.

Alaska, sine loco (Frederick Funston, 26); Muir Glacier, (Trelease, 2427 in part).

Bryum pallens Sw. Musc. suec., pp. 47, 98, pl. 4, f. 12.

From head of Russell Fiord (Coville and Kearney, 960); Disenchantment Bay (Trelease, 2522; forma *rubro-vinosa*). New to Alaska.

BRYUM PSEUDOSTIRTONI Philib. sp. nov.

(Pl. XVIII, fig. 4^{a-g}).

Sæpe synoicum, dense cespitosum, sordide vel lutescenti-viride. Caulis elongatus, filiformis, parce ramosus, 2.5–4 centim. altus. Folia mollia, laxiuscula, sicca erecto-imbricata, madida erecto-patentia, caulina ovato-lanceolata, acuminata costaque longe excurrente cuspidata, 2 millim. longa, 0.7 lata, marginibus integris planis vel subreflexis, costa angusta, 60–70 μ basi lata, rete laxo, cellulis inferioribus rectangulis, mediis superioribusque ovato-hexagonis, long. 28–50 μ , lat. 14–17, marginalibus angustioribus. Folia ramea minora, inferiora ovata, subobtusata vel breviter cuspidata. Capsula in pedicello gracili, 1.5 centim. longo, nutans vel pendula, oblonga, parva, 2 millim. longa, collo brevi attenuata, sicca sub or eonstricta, operculo conico-mamilato. Exostomii dentes pallidi, basi rubri. Endostomium perfectum, ciliis nunc longe appendiculatis, nunc simplicibus. Sporæ 12–18 μ crassæ.

From Muir Glacier (Trelease, 2448, 2459).

BRYUM HARRIMANI sp. nov.

(Pl. XXI, fig. 1^{a-g}).

Sat robustum, densiuscule cespitosum, lutescenti-viride. Caulis erectus, 3-4 centim. altus, fragilis, radiculosus, laxe foliosus, ramosus, ramis erectis, obtusis. Folia mollia, sicca erecto-patentia, madida patula, 1.2-1.6 millim. longa, 0.8-0.9 lata, basi paululum decurrentia, integra, margine plana vel subreflexa, dimorpha, inferiora ovato-lanceolata, acuta, superiora et ramulina late ovata, valde concava, apice obtuso cucullato, costa tenui, 40-45 μ basi crassa, in foliis inferioribus acutis percurrente vel breviter excurrente, in superioribus obtusis sub apice evanida, rete laxissimo, parce chlorophylloso, cellulis inferioribus quadratis vel breviter rectangulis, long. 40-50 μ , lat. 25-35, cæteris ovato-hexagonis, marginalibus linearibus 1-2 seriatis. Cætera ignota.

From Yakutat Bay (Trelease, 1793); Hidden Glacier Inlet (Trelease, 1784 in part, 1815).

This moss can be placed near *B. obtusifolium* Lindb. from which it is easily distinguished by its dimorphous leaves, plane on the borders, and of a looser texture.

Bryum pseudotriquetrum Schw. Suppl., I, II, p. 110.

From Muir Glacier (Trelease, 1806, 2435a); Kodiak (Trelease, 1848a, 1850); Unalaska (Trelease, 2299); St. Paul Island (Trelease, 2068).

Bryum duvalii Voit, in Sturm, Deutsch. fl., II, Heft 12.

From Yakutat Bay (Trelease, 1817 in part, 1822 in part); Port Wells (Trelease, 2285); Kodiak (Trelease, 1842, 1846).

BRYUM DUVALII OBTUSATUM var. nov.

A forma typica differt foliis obtusis, apice cucullato denticulato, basi paululum minus decurrentibus.

From Disenchantment Bay (Trelease, 2517).

BRYUM DREPANOCARPUM Philib. sp. nov.

(Pl. XVII, fig. 1^{a-h}.)

Ut videtur dioicum, laxiuscule cespitosum, fusco-viride vel rubro- vinosum. Caulis erectus, 1-2 centim. altus, inferne radiculosus, superne ramosus, ramis erectis, numerosis, gracilibus. Folia sicca erecto-flexuosa, madida erecto-patentia, circa 2 millim. longa, 0.9 lata, e basi haud vel parum decurrente oblongo-lanceolata, acuminata, acuta vel costa excurrente brevissime cuspidata, marginibus integris, reflexis, anguste limbatis, costa tenui, attenuata, in foliis inferioribus percurrente, in superioribus breviter excedente, rete parce

chlorophylloso, cellulis mediis subrectangularibus vel oblongo-hexagonis, long. 47-70 μ , lat. 16-22. Capsula in pedicello rubello, 1.5-2 cent. longo, nutans vel inclinata, ætate fusca, oblonga, collo longo attenuata, falcato-curvata, matura orificio dilatata, operculo conico. Peristomium perfectum; exostomii dentes basi rubri; endostomii membrana elata, ciliis appendiculatis.

From Juneau (Canby, 485; Coville and Kearney, 579); Disenchantment Bay (Trelease, 2515).

This species, which offers many points of resemblance to *B. meeseoides* Kindb., differs from it by the peristomial teeth which are firmer, stiffer, more scabrous and reddish at the base, the segments more acuminate and perforate from more irregular openings, and the higher membrane.

Subgenus ANOMOBRYUM Sch.

Bryum bullatum C. Müll. in Flora, 1887, p. 221.

From Takhin valley (Krause brothers).

Other species of the genus *Bryum* which have been recorded from Alaska and the islands of Bering Sea are the following: *B. alaskanum* Kindb., *B. brachyneuron* Kindb., *B. capillare* Linn., *B. erythrophyllum* Kindb., *B. fallax* Milde, *B. froudei* Kindb., *B. lacustre* Brid., *B. meeseoides* Kindb., *B. microstegioides* Kindb., *B. obtusifolium* Lindb., *B. pendulum* Sch., *B. wrightii* Sulliv.

Quite recently, the late Mr. Philibert has described in the *Revue Bryologique*, 1901, fasc. 2, two other new species, *B. submuticum* and *B. suborbiculare*, collected in the vicinity of Dawson by Mr. R. S. Williams.

Family MNIACEÆ.

Mnium medium Br. eur., fasc. 5, p. 32, pl. 10.

From Yakutat Bay (Trelease, 1720, 1721 in part); Disenchantment Bay (Trelease, 1718, 1719a; Coville and Kearney, 1075); Point Gustavus (Coville and Kearney, 785).

Mnium affine Bland. Musc. frond. exsic., fasc. III, no. 133. Schw. Suppl., I, II, p. 134.

From Muir Glacier (Trelease, 1713); Kodiak (Trelease, 1725b); Agattu Island (U. S. S. *Albatross* Exped., 38).

Mnium affine elatum Br. eur., fasc. 5, p. 30, in part.

From Kodiak (Trelease, 1726); St. Paul Island (Trelease, 2093; a stunted form).

Mnium rugicum Laur. in Flora, 1827, p. 292.

From Kodiak (Trelease, 1725a); Plover Bay, Siberia (Trelease, 2100).

Proc. Wash. Acad. Sci., July, 1902.

Mnium insigne Mitt. in Hook. Journ. of bot., 1856, p. 230.

From Alaska, sine loco (Evans, 1897); Wrangell (Trelease, 1711); Cape Fox (Trelease, 2380); Sitka (Trelease, 1714b, 1716); St. Paul Island (Trelease, 2069). New to Alaska.

Mnium spinulosum Br. eur., fasc. 31, Suppl. p. 4, pl. 4.

From Skagway (Canby, 480).

Mnium punctatum elatum Sch. Syn., ed. 1, p. 398.

From Port Wells (Trelease, 1723, 1724; Coville and Kearney, 1294); Indian camp, Yakutat Bay (Brewer and Coe, 642 in part); Disenchantment Bay (Trelease, 1717); Cape Karluk (Brewer and Coe, 687); Sitka (Trelease, 1715 in part); Kodiak (Trelease, 1725); St. George Island (C. Hart Merriam in 1891).

MNIUM PUNCTATUM ANCEPS var. nov.

A forma typica differt foliis sæpe cucullatis cellulisque superioribus multo minoribus, fere isodiametricis ut in *M. glabrescente*, sed ab illo limbo haud incrassato distincta.

From Unalaska (Trelease, 1727).

Mnium nudum Williams in Bryologist, 1900, p. 6.

From Yakutat Bay (Trelease, 1721). New to Alaska.

This specimen agrees exactly with *M. nudum* Williams, from Idaho and Montana. Mr. Williams mentions as distinctive characters for his species, in comparison with *M. punctatum*, nothing but the unthickened margin of the leaf and the naked, not radiculose stems. Now, in the European specimens of *M. punctatum* var. *elatum*, it very often happens that the margin of the leaf is not thickened at all or only slightly towards the base; this character, therefore, is not valuable. But, besides the naked or hardly radiculose stems and the smaller height, *M. nudum* differs from *M. punctatum* var. *elatum* by a more regularly hexagonal areolation, the cells towards the margins being larger (45–55 μ instead of 28–35) and the ones near the costa of the same length as in the allied species (70–100 μ) but broader (50–60 μ , instead of 40–45); and the lid of *M. nudum* is shortly apiculate, while in *M. punctatum* it is rather long beaked. However, these distinctive characters are not of great importance, and it seems to us preferable to regard *M. nudum* as a subspecies of *M. punctatum*.

Mnium glabrescens Kindb. Notes on Canad. bryol., 1893.

From Alaska, sine loco (W. H. Evans, 1897); Farragut Bay (Trelease, 1712, 2417; Brewer and Coe, 611, 614); Orca (Trelease, 1722, 2248; Setchell, 1200); Port Wells (Trelease, 2265); Sitka

(Trelease, 1714, 1715; Canby, 461; Setchell, 1254; W. G. Wright, 1604); Prince of Wales Island (J. M. Macoun); St. George Island (J. M. Macoun); Yes Bay (Gorman, 184 in part); Wood Island (Brewer and Coe, 664).

This species is distinguished from *M. punctatum* by its cells which are nearly isodiametric and much smaller, by its larger and thicker margo, the axile fascicle of the nerve, which is colored in red and forms a line generally very distinct, the larger spores (44–55 μ , instead of 30–40) and the higher peristome (0.75 millim., instead of 0.60). Moreover the nerve is usually shorter than in *M. punctatum*.

Mnium subglobosum Br. eur., fasc. 31, Suppl., p. 3, pl. 3.

From Disenchantment Bay (Trelease, 1719); Port Wells (Coville and Kearney, 1293); St. Paul Island (J. M. Macoun).

Mnium cinclidioides Hüb. Muscol. germ., p. 416.

From Douglas Island (Trelease, 2410; a small form).

Leucolepis acanthoneura Lindb. Mniac. europ., p. 80.

From Alaska, sine loco (W. H. Evans, 1897); Sitka (J. M. Macoun).

Aulacomnium palustre Schw. Suppl., III, 1, 1, pl. ccxvi.

From Muir Glacier (Trelease, 1896); Wrangell (Trelease, 1907); Port Clarence (Trelease, 1900, 1901); Kodiak (Trelease, 1845, 1851, 1898, 1919, 1924); Popof Island (Saunders, 1858); St. Matthew Island (Trelease, 1905); St. Lawrence Island (Trelease, 1903); Plover Bay, Siberia (Trelease, 2547).

Aulacomnium turgidum Schw. Suppl., III, 1, 1.

From Port Clarence (Trelease, 1986); St. Matthew Island (Trelease, 1887 in part, 1904); St. Paul Island (J. M. Macoun).

Aulacomnium androgynum Schw. Suppl., III, 1, 1, pl. ccxv.

From Sitka (Trelease, 2371); Kodiak (Trelease, 2185). New to Alaska.

Timmia austriaca Hedw. Spec. musc., p. 176, pl. XLII, f. 1–7.

From White Pass (Trelease, 2310 in part).

A sterile and stunted form, with short leaves.

Family POLYTRICHACEÆ.

BARTRAMIOPSIS LESCURI Card. & Thér. not Kindb.

(Pl. XXI, fig. 2^{a–l}.)

Atrichum lescurii JAMES, Manual, p. 257.

Bartramiopsis sitkana KINDB. (ut subsp.) in Rev. bryol., 1894, p. 35.

From Virgin Bay (Trelease, 1733); Orca (Trelease, 1731); Douglas Island (Trelease, 1729, 1730).

The moss which was described by Mr. Kindberg under the name of *B. lescurii*, from sterile specimens collected in Japan, does not seem to be the true *Atrichum lescurii* James, because its leaves are only incurvate and not crispate when dry. On the contrary, it is probable that *B. sitkana* of Kindberg, equally described from sterile specimens, differs in nothing from the species of James. The latter was, after all, imperfectly known until now, the author having seen neither the calyptra nor the lid, and having been unable to ascertain the existence or absence of a peristome. Therefore, we here give a complete description with drawings of this interesting moss, which, by the absence of the peristome and chiefly by the structure of its leaves, which, except on the borders, consist of two layers of cells, seems to us to constitute a genus distinct from *Atrichum*.¹

Dioicum, laxe cespitosum, atroviride. Caulis gracillimus, filiformis, flexuosus, simplex furcatusve, laxe foliosus, inferne longissime denudatus, 2-8 cent. altus. Folia sicca crispatissima, madida arcuato-patula, 4 millim. longa, basi subvaginantia, lineari-lanceolata, acuminata, marginibus basis inferne integris, superne utroque latere 3-5 ciliis longis ornatis, marginibus laminæ planis valde serratis, haud limbatis, costa lata, dorso levi, ventro lamellosa, lamellis 5-8, margine dentatis, in sectione transversali e 6-8 seriebus cellularum formati; cellulis basilaribus areolationis rectangulis, hyalinis, 4-6 long. quam lat., rete laminæ opaco, cellulis minutis hexagonis (diam. 8 μ), bistratosis, tantum ad margines unistratosis ibique limbum translucentem fingentibus. Capsula in pedicello rubello brevi, 8-12 millim. longo, erecta, primum breviter ovato-cylindrica, ætate turbinata, gymnostoma, ore valde dilatato, epiphragmate columellæ adhærente clauso, operculo alte conico, longe acuminato, capsulam fere æquante. Calyptra nuda, glabra, breviter acuminata, operculum tantum obtegens. Sporæ ovatæ vel subtrigonæ, diam. 12-16 μ .

Atrichum parallelum Mitt. in Journ. Linn. Soc., VIII, p. 48, pl. 8.

A. leiophyllum KINDB. in Bull. Torr. Bot. Club, XVII, p. 275.

From Douglas Island (Trelease, 1728, 2415); Port Etches (J. M. Macoun).

A. leiophyllum Kindb. cannot be specifically distinguished from *A. parallelum* Mitt., the characters put forward by Mr. Kindberg to justify the creation of his species being liable to vary on the same specimen. Such is more particularly the case with number 217 of the *Canadian Musci*, the leaves of which are sometimes destitute of dentate crests on the back and sometimes possess them well-developed.

¹ See Note 2, p. 347.

On other specimens, coming from Vancouver Island, the crests are more generally wanting; however, they are sometimes found and the leaves often bear sparse teeth on the back toward the apex; moreover, the nerve is always lamelliferous on both sides, at least in the upper part.

Oligotrichum aligerum Mitt. in Journ. Linn. Soc., VIII, p. 48, pl. 8.

From Kodiak (Brewer and Coe, 658).

Oligotrichum integrifolium Kindb. in Rev. bryol., 1894, p. 40.

O. hercynicum var. *latifolium* C. MÜLL. & KINDB. in Macoun, Cat. Can. pl., VI, Musci, p. 149.

From St. Lawrence Island (J. M. Macoun). New to Alaska.

Mr. Kindberg has attributed this moss to *O. hercynicum* typicum, but it certainly belongs to his *O. integrifolium*, characterized by its broader leaves, smooth and entire on the back, and by the cells of the leaf-areolation which are much larger; characters which appear to us sufficient to admit of a specific distinction.

Psilopilum arcticum Brid. Bryol. univ., II, p. 95.

From Port Clarence (Trelease, 2113, 2114, 2526); St. Paul Island (J. M. Macoun); St. Matthew Island (Coville and Kearney, 2125).

The specimens from St. Matthew Island have their stem-leaves a little longer than those of the European specimens, their basilar cells with thicker walls and their perichætal leaves hardly different from the comal ones, and thus almost exactly agree with *Catharinea* (*Psilopilum*) *tshuctschica* C. Müll., which does not appear to us a good species.

Pogonatum capillare dentatum Lindb. in Act. Soc. Sc. Fenn., 1872, p. 266.

Polytrichum dentatum MENZ. in Trans. of the Linn. Soc., IV, p. 80, pl. 7, f. 4.

From Juneau (Trelease, 1656; Brewer and Coe, 691a, 693, 695; Coville and Kearney, 583; Setchell, 1230; Canby, 435, 436 in part); Port Wells (Trelease, 1654); Kodiak (Trelease, 1653); Douglas Island (Trelease, 1657); St. Paul Island (J. M. Macoun).

Pogonatum dentatum (Menz.) Brid. is but a western race of *P. capillare*, characterized by having slenderer stems than those of the type, and by its pedicel which is not usually so flexuous.

Pogonatum contortum Lesq. in Mem. Calif. Acad. I, p. 27.

P. erythrodontium Kindb. in Macoun, Cat. Can. pl., VI, Musci, p. 150.¹

¹As regards this synonymy, see Cardot, Étude sur la flore bryologique de l'Amérique du Nord. Revision des types d'Hedwig et de Schwægrichen; in Bull. de l'herb. Boissier, VII, pp. 366-368.

From Juneau (Canby, 436 in part); Wrangell (Trelease, 1652); Orca (Trelease, 1732; Coville and Kearney, 1306 in part); Kodiak (Trelease, 1847); Prince of Wales Island (J. M. Macoun); Yes Bay (Gorman, 182, with a slender, elongated male form of *Dicranella heteromalla*).

Pogonatum urnigerum Pal. Beauv. Prodr., p. 84.

From Hidden Glacier Inlet, Yakutat Bay (Trelease, without number); Disenchantment Bay (Trelease, 1655); Hubbard Glacier (Coville and Kearney, 1072); Muir Glacier (Trelease, 1660).

Pogonatum alpinum Rœhl. in Ann. Wett. Ges., III, p. 226.

From Alaska, sine loco (W. H. Evans in 1897); Juneau (Canby, without number; Trelease, 1680; Coville and Kearney, 560, 581); Yakutat Bay (Trelease, 1688; Brewer and Coe, 648); Point Gustavus (Coville and Kearney, 792); Port Wells (Trelease, 1658, 1690); Orca (Trelease, 1691, 1692); Kukak Bay (Coville and Kearney, 1605); Sitka (Trelease, 1685); Kodiak (Trelease, 1695); Douglas Island (Trelease, 1683b); Unalaska (J. M. Macoun); Attu Island (L. M. Turner); Kiska Island (U. S. S. *Albatross* Exped., 9); St. Paul Island (J. M. Macoun; L. J. Cole; Trelease, 1661, 1699; Coville and Kearney, 1821); Hall Island (Trelease, 1663; Brewer and Coe, 675); Plover Bay, Siberia (Trelease, 2545; Coville and Kearney, 1860).

Numerous forms, many of which pass to var. *macounii*.

POGONATUM ALPINUM MACOUNII var. nov.

P. macounii KINDB. in Bull. Torr. Bot. Club, XVI, p. 96.

From Alaska, sine loco (W. H. Evans in 1897); Juneau (Setchell, 1237); Foggy Bay, near Cape Fox (Coville and Kearney, 2573); Prince of Wales Island (J. M. Macoun); Sitka (W. G. Wright, 1603).

No precise limits exist between *P. alpinum* and *P. macounii*. Kindberg attributes 60 lamellæ to the leaves of his species, but on the specimens which he sent to us we find only from 40 to 50 lamellæ; and, on the other hand, *P. alpinum*, to which he attributes only 30 lamellæ, often has 40. (Cfr. Barclay, *Muscinees de la France*, p. 198, and Limpricht, *Laubmoose*, II, p. 615.) There is no other more constant difference between the two mosses. *P. macounii* is therefore only a variety of *P. alpinum*, characterized by its greater dimensions, its longer leaves, more widely spreading when dry and usually provided with more numerous lamellæ (40 to 50). This var. *macounii* represents an extreme form of *P. alpinum*, of which the

other extreme is var. *brevifolium*. In the specimens from Alaska we find all gradations of form between the two varieties.

Pogonatum alpinum septentrionale Brid. Bryol. univ., II, p. 131.

From Kodiak (Trelease, 1676); St. Paul Island (J. M. Macoun).

Pogonatum alpinum arcticum Brid. Bryol. univ., II, p. 131.

From Egg Island, Disenchantment Bay (Coville and Kearney, 1006).

Pogonatum alpinum brevifolium Brid. Bryol. univ., II, p. 131.

From St. Paul Island (Trelease, 1661 in part); St. Lawrence Island (Trelease, 1664); St. Matthew Island (Trelease, 1662); Plover Bay, Siberia (Trelease, 1670; Brewer and Coe, 667).

Pogonatum alpinum simplex Sch. Syn., ed. 2, p. 539.

From Port Clarence (Trelease, 1665). New to Alaska.

P. atrovirens Mitt. has been recorded from Alaska by Kindberg. *P. microdontium* Kindb., from St. Paul Island, seems to us not distinct from *P. alpinum* var. *septentrionale*.

Polytrichum formosum Hedw. Spec. musc., p. 92, pl. 19, figs. 1, *a*.

From Alaska, sine loco (W. H. Evans in 1897); Juneau (Trelease, 1681; Canby, 429); New Metlakatla (Trelease, 1678*a*, 1679); Wrangell (Trelease, 1679 bis; Canby, 434); Farragut Bay (Brewer and Coe, 610); Orca (Coville and Kearney, 1306; Setchell, 1204); Virgin Bay (Trelease, 1689); Sitka (Trelease, 1684, 1687; Coville and Kearney, 811); Hot Springs (Trelease, 1686); Kodiak (Trelease, 1694); Douglas Island (Trelease, 1682, 1683).

Polytrichum gracile Dicks. Menz. in Trans. Linn. Soc., IV, p. 73, pl. 6, fig. 3.

From Kodiak (Trelease, 1675). New to Alaska.

Polytrichum commune Linn. Spec. pl., II, p. 1109.

From Alaska, sine loco (W. H. Evans in 1897); between Cook Inlet and the Tanana River (Capt. E. F. Glenn in 1899); Kodiak (Trelease, 1693; L. J. Cole).

POLYTRICHUM YUKONENSE sp. nov.

(Pl. XXII, fig. 1*a-f*.)

Caulis 5-8 centim. altus, simplex vel parcellissime ramosus, inferne longe denudatus, basi tomento albido obtectus. Folia rigida, sicca suberecta, madida erecto-patentia, 4-6 millim. longa, 1 lata, e basi appressa subvaginante lutescente breviter lineari-acuminata, in cuspidem fuscā integram attenuata, marginibus erectis integris, lamellis circiter 30, elatis, margine crenulatis, in sectione transversali e 8-12 cellulis

compositis, cellula apicali majore, profunde emarginata. Cætera ignota.

From Yukon River (W. H. Dall, in 1867).

This species is easily distinguished from the smaller forms of *P. commune* by its short and entire leaves, its higher lamellæ with more deeply crenated borders and more strongly emarginated marginal cells.

A recently described species, *P. jensenii* Hagen (*P. fragilifolium* Lindb. fil. mss.), which has been found in Greenland, Spitzbergen, Lapland and Wyoming, comes very near our *P. yukonense* by its size and the height and structure of its lamellæ, but differs from it by its leaves being longer and dentate at the point, by the cells of the basilar and subvaginant part, which are wider, and by the much less emarginated apical cells of the lamellæ.

Polytrichum juniperinum Willd. Fl. berol. prodr., p. 305.

From New Metlakatla (Trelease, 16786); Point Gustavus (Coville and Kearney, 772 in part); Kodiak (Trelease, 1674, 1696); Long Island (Trelease, 1697); Port Clarence (Trelease, 1666, 1667, 1668; Brewer and Coe, 670; L. J. Cole).

Numbers 1667, 1668 of Trelase, and 670 of Brewer and Coe constitute a form near var. *alpinum* Sch.

Polytrichum strictum Banks apud. Menz. in Trans. Linn. Soc., iv, p. 77, pl. 7, f. 1.

From New Metlakatla (Trelease, 1659); Wrangell (Coville and Kearney, 414); Virgin Bay (Trelease, 1672, 1673; Coville and Kearney, 1237); Sitka (Trelease, 1671, 1687; Coville and Kearney, 893); Kodiak (Trelease, 1675).

Polytrichum hyperboreum R. Brown in Parry voyage, Suppl., p. 294. *P. boreale* KINDB. in Mac. Cat. Can. pl., vi, Musci, p. 155.

From St. Paul Island (J. M. Macoun); Plover Bay, Siberia (Coville and Kearney, 1860 in part).

It is impossible to distinguish from *P. hyperboreum* R. Br. the *P. boreale* of Kindberg, the characters mentioned by the author for the latter having no stability, even on the original specimens he has communicated to us.

P. sexangulare Fl., *P. piliferum* Schreb. and *P. behringianum* Kindb. have been reported by Kindberg from Alaska and the islands of Bering Sea.

Family FONTINALACEÆ.

Fontinalis patula Card. in Rev. bryol., 1896, p. 67.

From Sitka (Trelease, 2368). New to Alaska.

Family NECKERACEÆ.

Neckera pennata Hedw. Descr., III, p. 17, pl. 19.

From Skagway (Canby, 428).

N. menziesii Drumm., *N. douglasii* Hook. and *Alsia abietina* Sulliv., have been recorded from Alaska by Mr. Kindberg.

Family LEUCODONTACEÆ.

Antitrichia curtipendula Brid. Mant. musc., p. 136.

From Wrangell (Trelease, 1992; Coville and Kearney, 404); Cape Fox (Trelease, 1964a, 2012); Yakutat Bay (Trelease, 1821 in part, 1916); Orca (Trelease, 2010); Kodiak (Trelease, 1920 in part); Unalaska (Trelease, 1983; J. M. Macoun); Popof Island (Saunders, 2293); Mist harbor, Nagai Island (U. S. S. *Albatross* Exped.).

Antitrichia curtipendula gigantea Sulliv. Lesq. Musci bor. amer. exsicc., ed. 2, no. 356. Sch. Syn., ed. 2, p. 577.

From Yakutat Bay (Trelease, 1917); Point Gustavus (Coville and Kearney, 572); Cape Fox (Trelease, 1964); Hot Springs (Trelease, 2003); Kodiak (Trelease, 1922, 1931); Popof Island (Saunders, 2037); Unalaska (Trelease, 1984).

This variety is not always larger than the type; it is specially characterized by its nerve being provided at the base with longer and more numerous fascicles (5-8 instead of 2-4); but doubtful forms are frequent.

A. californica Sulliv. has, teste Rothrock, been reported from Alaska by Kindberg.

Family HOOKERiaceÆ.

Pterygophyllum lucens Brid. Mant. musc., p. 149.

Sine loco (Brewer and Coe, 622). New to Alaska, if not collected in British Columbia.

Family LESKEACEÆ.

Myurella julacea Br. eur., fasc. 46-47, p. 3, pl. 1.

From Port Wells (Trelease, 2286 in part).

Myurella julacea scabrifolia Lindb. Musc. scand., p. 37.

From Port Wells (Trelease, 1832 in part). New to Alaska.

Family ISOTHECIACEÆ.

Climacium dendroides Web. & Mohr, Reise in Schwed., p. 96.

From Alaska sine loco (U. S. S. *Albatross* Exped.); Disenchantment Bay (Trelease, 1703); Muir Glacier (Trelease, 1701); Head of Russell Fiord (Coville and Kearney, 949); Kodiak (Trelease,

1706); Hall Island (Trelease 1707); St. Paul Island (J. M. Macoun).

The specimens from St. Paul Island are remarkable by their leaves being entire or nearly so, and provided with rounded auricles, larger than in the type. In *C. americanum* Bridl., the auricles are still more developed, and the areolation is chiefly formed of much shorter and wider cells. By its entire or subentire leaves, the form from St. Paul Island comes near var. *oregonense* Ren. & Card.

Climacium ruthenicum Lindb. Act. Soc. Fenn., x, p. 248.

From Juneau (Setchell, 1231; Coville and Kearney, 599); Yakutat Bay (Trelease, 1704); Virgin Bay (Trelease, 1705); Port Etches (J. M. Macoun); Sitka (Trelease, 1702; Canby, 407).

Orthothecium intricatum Br. eur., fasc. 48, p. 4, pl. 2, 3.

From Bailey Harbor (U. S. S. *Albatross* Exped., 1893). New to Alaska.

A small form mixed with *Claopodium bolanderi* Best.

Orthothecium chryseum Br. eur., fasc. 48, p. 3, pl. 2.

From Port Wells (Trelease, 1897).

Family THUIDIACEÆ.

Pseudoleskea atrovirens Br. eur., fasc. 49-51, p. 2, pl. 1.

From Yakutat Bay (Trelease, 1746a). New to Alaska.

Pseudoleskea radicata Best in Bull. Torr. Bot. Club, xxvii, p. 230.

P. rigescens REN. & CARD. Musci Am. sept. exsicc., no. 93.

From Muir Glacier (Trelease, 1911).

A slender and somewhat etiolated form.

Pseudoleskea stenophylla Ren. & Card. in Bot. Centralbl., 1890, no. 51, p. 421.

P. rigescens BEST, loc. cit., p. 232.

Lecuræa imperfecta C. MÜLL. & KINDB. in Mac. Cat. Can. pl., vi, Musci, p. 170, fide Best.

From Yakutat Bay (Trelease, 1759, 2056); Muir Glacier (Trelease, 1782, 2442, 2452, 2453); Point Gustavus (Coville and Kearney, 753 in part). New to Alaska.

Numbers 2056 of Trelease, and 753 in part of Coville and Kearney, exactly agree with the type of Washington; the Muir Glacier plant has the leaves somewhat wider at the base, but the form of the segments of the endostome and the other characters leave no doubt as to its correct reference to *P. stenophylla*. Number 1759, from Yakutat Bay, is a stouter and sterile form, the determination of which is rather doubtful.

In his valuable *Revision of the North American species of Pseudoleskea* (Bull. Torr. Bot. Club, xxvii), Dr. Best has substituted the name *P. rigescens* (Wils.) Lindb. for *P. stenophylla* Ren. & Card. It is impossible for us to admit any well grounded reason for this change; for, if Dr. Best saw, as he affirms, a specimen of *Leskea rigescens* Wils. identical with *P. stenophylla* Ren. & Card., on the other hand, we possess one which certainly belongs to *P. radicata* (Drummond, Musci Americani, no. 225). Moreover, Dr. Best himself acknowledges that both species were mixed up under this number of Drummond's exsiccata and under the name *Hypnum congestum* Hook. & Wils. Now, as Wilson never described his *Leskea rigescens*, it is impossible to know to which of the two species he wished to give this name, and that must, therefore, be definitely abandoned. One of the two species should be called *P. radicata* (Mitt.) Best, the other should preserve the name *P. stenophylla* Ren. & Card.

Thuidium abietinum Br. eur., fasc. 49-51, p. 9; pl. 5.

From Port Clarence (Trelease, 2034, 2036).

Claopodium bolanderi Best, in Bull. Torr. Bot. Club, xxiv, p. 431.

From Bailey Harbor (U. S. S. *Albatross* Exped. in 1893); Kodiak (J. M. Macoun).

Kindberg mentions *C. crispifolium* and *C. laxifolium* as coming from Alaska. His specimens of *crispifolium* that we have seen belong to *C. bolanderi*. We have not seen any of the second one. Otherwise, it has been established that *Leskea laxifolia* Hook. is none other than *Brachythecium reflexum* Br. eur.

Family HYPNACEÆ.

Camptothecium nitens Sch. Syn., ed. 1, p. 530.

From Point Gustavus (Coville and Kearney, without number).

C. lutescens Br. eur. has also been reported from Alaska.

BRACHYTHECIUM BERINGIANUM sp. nov.

(Pl. xxii, fig. 3^{a-c}.)

Dense cespitosum, habitu formis minoribus *B. albicantis* simile. Caulis erectus, 3-4 centim. altus, ramosissimus, ramis erectis, interdum fastigiatis, julaceis, acutis. Folia conferta, imbricata, caulina 1.5 milim. longa, 0.8 lata, ovato-lanceolata, basi paululum decurrentia, sat abrupte et breviuscule acuminata, concava, plicata, marginibus integris planis vel parce reflexis, ramea minora et angustiora, longius acuminata, costa tenui, basi 30-35 μ crassa, vix ad medium producta, sæpe furcata et interdum brevissima, cellulis alaribus numerosis, quadratis, in 5-6

seriebus secundum margines superne productis, cæteris linearibus, 40-45 μ longis, 6-7 latis, parietibus incrassatis. Cætera ignota.

From St. Paul Island (Trelease, 1861, 2087); Agattu Island (U. S. S. *Albatross* Exped., 40).

Distinct from *B. acuminatum* Ren. & Card. by its habit, its more abruptly acuminate leaves, etc. It more closely resembles *B. albicans* Br. eur., from which it differs by its shorter and more abruptly acuminate leaves, its quadrate more numerous alar cells, its more chlorophyllose areolation, and by its narrower, short and often bifurcate costa.

Brachythecium albicans Br. eur., fasc. 52-54, p. 19, pl. 19.

From Yakutat Bay (Trelease, 2342); Muir Glacier (Trelease, 1909); Wrangell (Canby, 468, 472); Sturgeon River Bay, Kodiak (Trelease, 1930); St. Paul Island (Trelease, 1863); Agattu Island (U. S. S. *Albatross* Exped., 16 in part). Several forms.

Brachythecium salebrosum Br. eur., fasc. 52-54, p. 16, pl. 15, 16.

From Cape Fox (Trelease, 1762 in part, 1963); Skagway (Canby, 481 in part, forma *angustifolia*); Yukon River (W. H. Dall, in 1867); Sitka (Trelease, 2002); Agattu Island (U. S. S. *Albatross* Exped., 16 in part).

Brachythecium novæ-angliæ Jaeg. & Sauerb. Adumbr., II, p. 394.

From Kodiak (Trelease, 2057); St. Paul Island (Trelease, 2091). New to Alaska.

On these specimens nearly all the leaves are smooth on the back; however we have found a few branches with papillose leaves, which, added to the other characters, leaves no doubt as to their determination. Moreover, even on the specimens from New England, the leaves are sometimes quite smooth. This character is therefore variable, which prevents us from admitting the genus *Bryhnia*.

Mr. A. J. Grout has recently ascertained that *Hypnum chloropterum* C. Müll. & Kindb., from Canada, and *H. scabridum* Lindb., from Norway, should be reunited to *B. novæ-angliæ* (cf. Bull. Torr. Club, xxv, pp. 229-231). The distribution of this species, as it is now known, includes southern Norway, eastern Canada, Newfoundland, Miquelon Island, the Eastern States as far south as Maryland and as far west as Wisconsin, Alaska, the Bering Sea Islands and Japan.

Brachythecium rivulare Br. eur., fasc. 52-54, p. 13, pl. 12.

From Juneau (Trelease, 1796); Disenchantment Bay (Trelease, 1829); Orca (Trelease, 1840).

Number 1829 resembles *B. latifolium* (Lindb.) Philib. by its widely decurrent leaves; but the latter is a more slender plant, with a thinner costa and leaves hardly or not at all plicate.

Brachythecium reflexum pacificum Ren. & Card. in Bot. Centralbl. 1890, No. 51.

(Pl. xxiii, fig. 4^{a-c}.)

Eurhynchium pacificum KINDB. Eur. and N. Amer. br., p. 101.

From Juneau (Trelease, 2173); Wrangell (Trelease, 1937); Cape Fox (Trelease, 1760a); Yakutat Bay (Trelease, 1746, 1758, 1826, 2339); Disenchantment Bay (Trelease, 2512; Brewer and Coe, 634); Muir Glacier (Trelease, 1753, 1754, 1755, 2469). New to Alaska.

This variety, which seems to occur along the Pacific Coast from Oregon to Alaska, differs from the type by its stouter aspect, its stem-leaves larger, less triangular, rather ovate-lanceolate, not so abruptly acuminate, and revolute on the borders in the lower part, by its costa thinner and generally vanishing at the base of the acumen, and by its leaf-areolation composed of cells of the same width (about 9μ) but at least twice longer ($80-90\mu$, instead of $30-35$); those in the angles longer too, rectangular, seldom quadrate. These characters seem to be constant, and perhaps Mr. Kindberg is right in considering this moss as a species distinct from *B. reflexum*.

Brachythecium asperrium Kindb. in Mac. Cat. Can. pl., vi, Musci, p. 200.

From Cape Fox (Trelease, 2382). New to Alaska.

Brachythecium lamprochryseum giganteum Grout in Mem. Torr. Bot. Club, vi, p. 181.

From Atka Island (U. S. S. *Albatross* Exped., 44).

Brachythecium plumosum Br. eur., fasc. 52-54, p. 4, pl. 3.

From Kodiak (Trelease, 2194). New to Alaska.

Kindberg has mentioned *B. turgidum* Hartm. as Alaskan. Four species of the genus *Scleropodium*, viz: *S. illecebrum* Br. eur., *S. cespitosum* Br. eur., *S. colpophyllum* (Sulliv.) Grout, and *S. krausei* (C. Müll) Ren. & Card., have also been recorded from Alaska. We have not seen the first three; the last is a *Hypnum* of the section *Hygrohypnum*.

Eurhynchium myosuroides Sch. Syn., ed. 1, p. 549.

From Yakutat Bay (Trelease, 1820); Hot Springs (Trelease, 2003 in part); Unalaska (U. S. S. *Albatross* Exped., 41).

Forms approaching var. *spiculiferum* Card., or doubtful between this and var. *substoloniferum* Card.

Eurhynchium myosuroides spiculiferum Card. in Bull. de l'herb. Boissier, VII, p. 431.

From Prince of Wales Island (J. M. Macoun).

Eurhynchium myosuroides humile Grav. in Rev. bryol., 1883, p. 33.

From New Metlakatla (Trelease, 1751 in part). New to Alaska.

Eurhynchium strigosum fallax Ren. & Card. in Bot. Gaz., 1889, p. 98.

From Skagway (Canby, 477, 481 in part, 482 in part).

Eurhynchium stokesii Br. eur., fasc. 57-61, p. 10, pl. 8.

From Cape Fox (Trelease, 1762a). New to Alaska.

Eurhynchium oreganum Jaeg. & Sauerb. Adumbr., II, p. 427.

From Hot Springs (Trelease, 2020). New to Alaska.

Eurhynchium cirrosum Husn. Muscol. gall., p. 338.

From Muir Glacier (Trelease, 1912).

E. myosuroides var. *stoloniferum* Auct., *E. strigosum* Br. eur. *typicum*, *E. vaucheri* Br. eur. and *E. stokesii* subsp. *pseudo-speciosum* Kindb. have been recorded by Kindberg from Alaska and the islands of Bering Sea.

Rhynchostegium serrulatum Jaeg. & Sauerb., Adumbr., II, p. 436.

From Alaska, sine loco (A. Kellogg). New to Alaska.

The presence of this species in Alaska is rather surprising; however, it is impossible not to refer to it the specimen we have had before our eyes.

Mr. Kindberg has recorded from Kodiak a *Raphidostegium subdemissum* Kindb. that we have not seen.

Plagiothecium undulatum Br. eur., fasc. 48, p. 17, pl. 13.

From Alaska, sine loco (W. H. Evans in 1897); Port Etches (J. M. Macoun); Point Gustavus (Coville and Kearney, 790); Orca (Trelease, 1739 in part, 1740; Setchell, 1214); Sitka (Trelease, 1736, 2497; Setchell, 1256; J. M. Macoun; W. G. Wright, 1609); Hot Springs (Trelease, 1735); Douglas Island (Trelease, 1737, 1743 in part).

PLAGIOTHECIUM FALLAX sp. nov.

(Pl. XXII, fig. 4^{a-c}.)

Dioicum, robustum, lutescenti-viride, nitidum. Caulis prostratus vel decumbens, 5-8 centim. longus, flexuosus, parce ramosus, apice attenuato sæpius radiculosus. Folia laxè complanato-disticha, siccitate subundulato-crispatula, 2.5 millim. longa, 1-1.3 lata, e basi haud decurrente oblongo-lanceolata, asymmetrica, late breviterque acuminata, longitudinaliter plicatula, marginibus planis integris, costa

gemella, inæquali, crure longiore ad $\frac{1}{3}$ vel $\frac{1}{2}$ producta, cellulis basilaribus paucis, quadratis vel breviter rectangulis, cæteris linearibus 125–225 μ longis, 9–14 latis. Cætera ignota.

From Douglas Island (Trelease, 1743 in part).

Resembling in habit the species of the *denticulatum* group, but very distinct by its leaves being not decurrent.

Plagiothecium denticulatum Br. eur., fasc. 48, p. 12, pl. 8.

From Cape Fox (Trelease, 2376); Orca (Trelease, 1739 in part, 1741, 1942); Yakutat Bay (Trelease, 2330); Sitka (Trelease, 1431, 2356, 2357, 2496); Douglas Island (Trelease, 2406).

Plagiothecium denticulatum undulatum Ruthe in litt. 1873. Geheeb in Rev. bryol., 1877, p. 42, fide Limpricht.

P. ruthei LIMPR. Laubm., II, p. 271.

From Yakutat Bay (Trelease, 2327). New to Alaska.

Plagiothecium denticulatum recurvum Warnst. Moosfl. d. Prov. Brandenb., p. 73, fide Limpricht.

P. curvifolium SCHLIEPH. mss. Limpr. Laubm., II, p. 269.

From Douglas Island (Trelease, 1738). New to Alaska.

Plagiothecium denticulatum donii Lindb. in Not. Sällsk. fauna et fl. fenn., 1867.

From New Metlakatla (Trelease, 1751 in part). New to Alaska.

Plagiothecium sylvaticum Br. eur., fasc. 48, p. 14, pl. 11.

From Juneau (Brewer and Coe, 6916); Kodiak (Trelease, 2192) New to Alaska.

Plagiothecium roeseanum Br. eur., fasc. 48, p. 15, pl. 10.

From Kodiak (Trelease, 1844, 2191). New to Alaska.

Plagiothecium muehlenbeckii Br. eur., fasc. 48, p. 11, pl. 6.

From Orca (Trelease, 2251); Kodiak (Trelease, 2207); Hot Springs (Trelease, 2349). New to Alaska.

Plagiothecium elegans Sulliv. Moss. of U. S., p. 80.

From Farragut Bay (Coville and Kearney, 469); Hot Springs (Trelease, 1742, 1757); Douglas Island (Trelease, 2391). New to Alaska.

P. pulchellum Br. eur. has been recorded from the islands of Bering Sea by Mr. Kindberg.

Amblystegium serpens Br. eur., fasc. 55–56, p. 9, pl. 3.

From Cape Fox (Trelease, 1760, 1761, 1762, 2375); St. Paul Island (Trelease, 2089 in part). New to Alaska.

AMBLYSTEGIUM SERPENS BERINGIANUM var. nov.

A forma typica differt foliis ovato-lanceolatis latioribus brevius acuminatis, costa validiore ad basin acuminis producta, cellulis basilaribus rectangulis, parietibus incrassatis.

From St. Paul Island (Trelease, 2089 in part).

Under number 1760 we found some stems of a stouter species, much resembling *A. radicale* (Pal. Beauv.) Mitt.

AMBLYSTEGIUM VARIUM ALASKANUM var. nov.

Robustius, dense ramosum, late depresso-cespitosum, folia breviora, late ovata, subito constricta, breviter et anguste acuminata, cellulis alaribus inflatis, multo majoribus.

From Muir Glacier (Trelease, 1752).

Genus *Hypnum* Dill.

Section CHRYSOHYPNUM Hpe.

HYPNUM TRELEASEI Ren. sp. nov.

(Pl. xxii, fig. 5^{a-c}.)

Dense cespitosum, fragile, lutescenti-viride. Caulis brevis, 2-3 centim. altus, erectus, inferne radiculosus, ramis erectis fastigiatis. Folia conferta, parva, subimbricata, interdum subhomomalla, 1.2 millim. longa, 0.6 lata, ovato-lanceolata, breviuscule acuminata, vix plicatula, plerumque magno augmento, præcipue basin versus, minute denticulata, costa gemella brevi, cellulis basilaribus quadratis vel breviter rectangulis, chlorophyllosis, externis elongatis decurrentibus, cæteris linearibus, 30-40 μ longis, 6-7 latis. Cætera ignota.

From Virgin Bay (Trelease, 2305); St. Matthew Island (Trelease, 2158, 2165).

The description here given, as also the drawing, is based on the St. Matthew Island specimens. The Virgin Bay specimen has the leaves longer, with a more elongated and narrower acumen, and a closer areolation, formed of longer and narrower cells. There is, however, no doubt of the specific identity of the two specimens. This species should be placed near *H. stellatum* Schreb., from which it is distinguished by its much smaller dimensions, its short and fastigiate stems, its leaves which are small, imbricate, shortly acuminate and for the most part finely denticulate, and, finally, by its small, quadrate alar-cells, the median ones shorter.

Hypnum stellatum Schreb. Spic. fl. lips., p. 92.

From Port Wells (Trelease, 1836); Kodiak (Trelease, 1923).

Hypnum polygamum minus Sch. Syn., ed. 1, p. 604.

From Yakutat Bay (Trelease, 2341). New to Alaska.

Section DREPANOCLADUS C. Müll.¹

Hypnum aduncum kneiffii Sch. Syn., ed. 2, p. 727.

From St. Paul Island (J. M. Macoun). New to Alaska.

This specimen was attributed by Mr. Kindberg to *H. conflatum* C. Müll. & Kindb. But, according to Renauld, it is impossible to separate it from *H. aduncum kneiffii*.

Hypnum fluitans Linn. Flor. suec., ed. 2, p. 899 in part.

From Yakutat Bay (Brewer and Coe, 690).

A form near var. *jeanbernati* Ren.

Hypnum fluitans alpinum Sch. Syn., ed. 1, p. 611.

From St. Lawrence Island (Trelease, 1981; Coville and Kearney, 1984; L. J. Cole). New to Alaska.

Hypnum fluitans exannulatum Ren. Rev. harpid., 1879.

From Yakutat Bay (Trelease, 1745). New to Alaska.

Hypnum revolvens Sw. Disp. musc. frond. suec., p. 101, pl. 7, f. 14.

From Kodiak (Trelease, 2030, 2031); St. Matthew Island (Trelease, 1890, 2163a); Hall Island (Trelease, 1663 in part, 2130 in part).

Hypnum uncinatum Hedw. Descr., iv, p. 65, pl. 25.

From Alaska, sine loco (F. Funston, 144); Juneau (Setchell, 1234; Canby, 486, 496; Coville and Kearney, 575); Skagway (Canby, 481 in part); Wrangell (Trelease, 2017); Head of Russell Fiord (Coville and Kearney, 950); Disenchantment Bay (Trelease, 1958, 2023, 2024); Orca (Trelease, 1961); Port Wells (Trelease, 1962, 2028); Muir Glacier (Trelease, 1951); Point Gustavus (Coville and Kearney, 753); Sitka (Trelease, 2005); Sturgeon River Bay, Kodiak (Trelease, 2225); Port Clarence (Trelease, 1971, 1973); St. Matthew Island (Coville and Kearney, 2129); St. Paul Island (Trelease, 1864).

With forms passing to varieties *plumulosum*, *subulaceum* and *orthothecioides*.

¹ We are indebted to Mons. F. Renauld for the determinations of the species of this group.

Hypnum uncinatum forma **brevisetata** Ren. in litt.

From Skagway (Canby, 842 in part); Sitka (Trelease, 1938; Coville and Kearney, 898); Kodiak (Trelease, 2058).

Hypnum uncinatum forma **plumosa** Ren. in Husn., Muscol. gall., p. 378.

Hypnum uncinatum plumosum SCH. Syn., ed. 1. p. 612.

From Indian Camp, Yakutat Bay (Brewer and Coe, 642); Disenchantment Bay (Trelease, 1957); Point Gustavus (Coville and Kearney, 753 in part); Yukon River (W. H. Dall, in 1867); Port Clarence (Brewer and Coe, 672; Trelease, 2014); St. Matthew Island (Trelease, 1887 in part, 1888 in part); Hall Island (Trelease, 2133).

Hypnum uncinatum plumulosum Br. eur., fasc. 57-61, p. 31, pl. 20, fig. γ, 1, 2.

From Orca (Trelease, 1943); Indian Camp, Yakutat Bay (Brewer and Coe, 643; forma *crassa* ad var. *polare* accedens); Port Clarence (Trelease, 1969, 1970, 1972); St. Lawrence Island (Trelease, 1982); St. Matthew Island (Trelease, 2163); Hall Island (Trelease, 1967); Plover Bay, Siberia (Trelease, 1977).

HYPNUM UNCINATUM POLARE Ren. var. nov.

Habitu varietati *plumulosum* simile, sed rete basilari laxiore parenchymatoso, cellulis mediis brevioribus, magis chlorophyllosis.

From St. Matthew Island (Trelease, 2159), Plover Bay, Siberia (Trelease, 1978).

Hypnum uncinatum subjulaceum Br. eur., loc. cit., fig. ε, 1, 2, forma **orthothecioides** Ren. in Husn. Muscol. gall., p. 378.

From Bailey Harbor (U. S. S. *Albatross* Exped.); Mist Harbor, Nagai Island (U. S. S. *Albatross* Exped.); Yakutat Bay (Trelease, 2026); Kodiak (Trelease, 1926, 1927); St. Paul Island (Trelease, 1975, 1985; J. M. Macoun); Hall Island (Trelease, 1966); Plover Bay, Siberia (Trelease, 1976; Coville and Kearney, 1851).

Section CRATONEURON Sulliv.

Hypnum filicinum Linn. Spec. pl., p. 1125.

From Yakutat Bay (Trelease, 1818); Hidden Glacier Inlet (Trelease, 1814); Disenchantment Bay (Trelease, 1825, 1955, 2511); Head of Russell Fiord; (Coville and Kearney, 956); Muir Glacier (Trelease, 1756, 1792, 1807). Several forms.

HYPNUM SULCATUM STENODICTYON Ren. var. nov.

Hypnum sulcatum SCH. Syn. ed., 1, p. 699.

A forma typica rete densiore cellulis angustioribus distincta.

From Muir Glacier (Trelease, 2019).

Section **PTILIUM** Sulliv.**Hypnum crista-castrensis** Linn. Sp. pl., p. 1125.

From Virgin Bay (Trelease, 2027); Sitka (Trelease, 2022); Kodiak (Trelease, 2054; Coville and Kearney, 2339, 2261*a*); Mist Harbor, Nagai Island (U. S. S. *Albatross* Exped.).

Section **STEREODON** Brid.**Hypnum circinale** Hook. Musci exot., pl. 107.

From Juneau (Brewer and Coe, 698); Yakutat Bay (Trelease, 2329); Farragut Bay (Trelease, 1935, 1936; Brewer and Coe, 618, 623); Orca (Trelease, 1748, 1941, 1943 in part, 1944, 2250, 2500; Setchell, 1210); Virgin Bay (Trelease, 2304); Sitka (Trelease, 1939, 1940; Coville and Kearney, 825; Setchell, 1257, 1267; Canby, 462; J. M. Macoun); Hot Springs (Trelease, 2345); Kodiak (Trelease, 1945, 2211; L. J. Cole); Wood Island (Brewer and Coe, 659, 660, 662); Prince of Wales Island (J. M. Macoun).

We do not distinguish from *H. circinale*, *H. sequoieti* C. Müll. in Flora, 1875, p. 91, the characters mentioned for the latter being inconstant and of little importance. We must equally refer to *H. circinale* the *Raphidostegium pseudorecurvans* Kindb. Not. on Canad. bryol., 1893, according to the specimens of the latter which were communicated to us by Mr. J. M. Macoun.

As we have said elsewhere (Revue bryologique, 1890, p. 18, and Hedwigia, 1893, p. 275) it was a mistake to describe *H. circinale* as being monœcious; it is certainly diœcious, for on a hundred specimens that we have had the opportunity of examining, we have never found flowers of both sexes on the same stem.

Hypnum callichroum Br. eur., fasc. 57-61, p. 27, pl. 16.

From Port Wells (Trelease, 1747); Orca (Trelease, 1749, 2261); Yakutat Bay (Trelease, 1746); Head of Russell Fiord (Coville and Kearney, 948 in part); Wrangell (Trelease, 2018); Port Etches (J. M. Macoun); Sitka (Trelease, 2021). New to Alaska.

Hypnum alaskæ Kindb. Not. on Canad. bryol., 1893.

From Port Etches (J. M. Macoun).

This species appears to be very close to the preceding, judging from the small specimen we received; however, it differs from it by its

smaller dimensions, its creeping and radiculose stems and its much narrower leaves.

Hypnum dieckii Ren. & Card. in Bot. Centralbl., 1890, no. 51. Hedwigia, 1893, p. 278.

From Orca (Trelease, 1960); Sitka (Trelease, 1744). New to Alaska.

Hypnum hamulosum Br. eur., fasc. 57-61, p. 20, pl. 10.

From Yakutat Bay (Trelease, 2025); Port Clarence (Trelease, 1968); Hall Island (Trelease, 2032).

The alar cells are here a little more numerous than on the European type; but we have specimens from the Pyrenees that are identical in this respect with those from Alaska.

Hypnum canadense Kindb. in Bull. Torr. Bot. Club, xvii, p. 280. Mac. Cat. Can. pl., vi, Musci, p. 236.

From Orca (Setchell, 1201); Prince of Wales Island (J. M. Macoun).

This species differs from *H. imponens* Hedw. by the auricles of the leaves being formed of one or two large outer hyaline cells, the inner cells being brown or yellowish.

Hypnum vaucheri Lesq. Cat. mouss. suisses, p. 48. Sch. Syn., ed. 1, p. 697.

From Bailey Harbor (U. S. S. *Albatross* Exped.).

Although the areolation is a little closer than usual, the alar cells, much more numerous than in *H. cupressiforme*, do not seem to leave any doubt on the determination of this moss.

Section HYGROHYPNUM Lindb.

Hypnum ochraceum Turn. in Wils. Bryol. brit., p. 400.

From Disenchantment Bay (Trelease, 1820); Kodiak (Trelease, 2195).

Hypnum ochraceum flaccidum Milde, Bryol. sil., p. 376.

From Disenchantment Bay (Trelease, 1828); Sitka (Trelease, 2366).

HYPNUM SUBEUGYRIUM OCCIDENTALE var. nov.

Hypnum subeugyrium REN. & CARD. in Bot. Gaz., xxii, p. 52.

A forma typica Terræ Novæ differt foliis pro more latioribus, mollioribus, magis concavis, apice integris, cellulisque alaribus paulo majoribus, auriculas interdum subinflatas sed semper multo minus distinctas quam in *H. eugyrio* efformantibus. Costa interdum sub-simplex.

From Hidden Glacier Inlet, Yakutat Bay (Trelease, 1784); Muir Glacier (Trelease, 1805).

Hypnum krausei C. Müll. in Flora, 1887, p. 224.

From Takhin valley (Dr. Krause).

This moss, that C. Müller placed in his section *Illecebrina*, which corresponds to the genus *Scleropodium* Br. eur., is certainly a *Hygrohypnum* (*Limnobium* Sch.), as appears from an examination of the original specimen, which was communicated to us by the Royal Botanical Museum in Berlin. It comes near *H. subeugyrium occidentale* Card. & Thér., but differs from it by its longer leaves, its almost scarious and much less chlorophyllose areolation, and its thinner costa.

Section CALLIERGON Sulliv.

Hypnum cordifolium Hedw. Descr., iv, p. 97, pl. 37.

From Yakutat Bay (Trelease, 1795); Kodiak (Trelease, 1842 in part); Sitka (Trelease, 2369).

Hypnum schreberi Willd. Prodr. fl. berol., no. 955.

From White Pass, 3,000 ft. (Trelease, 1950); Orca (Setchell, 1208); Sitka (Trelease, 2007); Port Clarence (Trelease, 1869, 2013, 2035); St. Matthew Island (Coville and Kearney, 2110); Hall Island (Trelease, 2033).

Hypnum sarmentosum Wahlenb. Fl. lapp., p. 380.

From Port Wells (Coville and Kearney, 1293 in part).

HYPNUM SARMENTOSUM BERINGIANUM var. nov.

Hypnum sarmentosum WAHLENB. Fl. lapp., p. 380.

A forma typica differt caulibus gracilioribus, laxius foliosis, costalatiore et praesertim cellulis alaribus multo minoribus, pro more quadratis, vix dilatatis.

From St. Matthew Island (Trelease, 1888 in part, 1889).

By the structure of the angles of the leaf, this moss comes near *H. brunneo-fuscum* C. Müll. from the Chukchi peninsula, but the latter has a different facies, a closer areolation and a much thinner costa.

Hypnum stramineum Dicks. Fasc. pl. crypt., II, p. 6, pl. 1, f. 9.

From Unalaska (U. S. S. *Albatross* Exped., 11); Port Clarence (Trelease, 1866, 1870).

Section CALLIERGIDIUM Ren. in litt.

Pseudocalliergon REN. in Bryologist, iv, p. 63, non Limpr.

HYPNUM PLESIOSTRAMINEUM Ren. sp. nov.¹

(Pl. XXIII, fig. 2^{a-h}.)

Cespites laxi, molles. Caulis gracilis, erectus, 4-6 centim. altus, simplex vel parce ramosus, ramis gracilibus. Folia sat conferta,

¹ See note 3, p. 347.

erecta, apice tantum paululum patentia, circa 1.4 millim. longa, 0.6 lata, diversiformia, inferiora ovato-oblonga vel subdeltoida, acuminata, subobtusata, superiora elliptica, acumine latiore et obtusiore, ramea ovata, rotundato-obtusata, omnia plicatula, marginibus planis sinuolatis, costa tenui, ad $\frac{3}{4}$ vel ultra producta, basi 40–50 μ crassa, cellulis alaribus magnis, laxis, hyalinis, auriculas inflatas pulchre distinctas efformantibus, mediis anguste linearibus, flexuosis, extremitatibus obtusis, 40–60 μ longis, 5–6 latis, apicalibus brevibus, ovatis vel subhexagonis. Cætera ignota.

From Yukon River (W. H. Dall, in 1867).

This species resembles both *H. stramineum* Dicks. and *H. pseudo-stramineum* C. Müll.; but it is with the latter that it has the closest affinity. It differs from it by its leaves being shorter, subdeltoid, with a costa thicker (40–50 μ instead of 30–40), longer, usually exceeding the $\frac{3}{4}$, and finally by the firm areolation, formed of flexuous cells, rather obtuse (not truncate) at the ends, with thick walls, and resembling those of *Hygrohypnum*.

The comparative figures of *H. pseudo-stramineum* given on Plate XXIII, were supplied to us by Mons. Renault, who drew them from an original collected by C. Müller at Halle-am-Saale.

Mr. Kindberg has described a *H. pseudo-complexum* Kindb. from Alaska, of which we have not seen any specimen. *H. alaskanum* Lesq. & Jam. is also unknown to us.

***Hylocomium splendens* Br. eur. fasc., 49–52, p. 5, pl. 1.**

From Alaska, sine loco (W. H. Evans, in 1897); Orca (Setchell, 1212; Trelease, 2050); Muir Glacier (Coville and Kearney, 673); Yakutat Bay (Trelease, 2049); Disenchantment Bay (Trelease, 2047); Head of Russell Fiord (Coville and Kearney, 957); New Metlakatla (Trelease, 2041); Farragut Bay (Trelease, 2042); Wrangell (Canby, 450); Karluk (Brewer and Coe, 686); Koyukuk River (F. C. Schrader, in 1899); Sitka (Setchell, 1260; Trelease, 2045, 2046; W. G. Wright, 1605); Kodiak (L. J. Cole; Trelease, 2029, 2052, 2053); Wood Island (Brewer and Coe, 663).

***Hylocomium splendens gracilius* Boul. Musc. de la France, p. 10.**

H. alaskanum KINDB. in Mac. Cat. Can. pl., VI, Musci, p. 248.

From Muir Glacier (Trelease, 2043, 2044); Kodiak (Trelease, 2051); Unalaska (J. M. Macoun); Popof Island (Saunders, 2038); Hall Island (Trelease, 1989 in part, 2055, 2056).

This variety is *Hylocomium alaskanum* of Kindberg, but we much doubt whether it is the true *Hypnum alaskanum* of Lesquereux

and James (Proced. Amer. Acad., xiv, p. 139, and Manual, p. 405). These authors compare their plant to *Hypnum Schreberi*, to which this var. *gracilius* bears no resemblance, and attribute to it obtuse leaves, whereas they are apiculate on the moss of which we are speaking. Besides, it would be very surprising if such experienced bryologists as Lesquereux and James had not noticed the evident relations which would have existed between their species and *Hylocomium splendens*, if the identification proposed by Mr. Kindberg was exact. Until the contrary is proved, we think that *H. alaskanum* Lesq. & Jam. is a different species, much more resembling *H. schreberi* than *Hylocomium splendens*.

Hylocomium umbratum Br. eur., fasc. 49-52, p. 6, pl. 2.

From Yakutat Bay (Trelease, 1965 in part); Disenchantment Bay (Trelease, 2048). New to Alaska.

Hylocomium squarrosum Br. eur., fasc. 49-52, p. 9, pl. 6.

Yakutat Bay (Trelease, 1821 in part, 1959, 2328); Point Gustavus (Saunders, 2000); Cape Fox (Trelease, 1965); Sturgeon River Bay, Kodiak (Trelease, 1932); Unalaska (U. S. S. *Albatross* Exped., 19); St. Paul Island (Trelease, 1862, 1974); Hall Island (Trelease, 1883).

Numbers 1959, 1965 and 2000 are forms coming more or less near *H. calvescens* (Wils.) Jaeg., but on the plant from Finland the acumen is broader and shorter, which constitutes the chief character of this form, which, otherwise, it is impossible for us to specifically separate from *H. squarrosum*.

Hylocomium loreum Br. eur., fasc. 49-52, p. 7, pl. 4.

From Alaska, sine loco (W. H. Evans, in 1897); Yakutat Bay (Brewer and Coe, 648a; Trelease, 1956, 2009); Disenchantment Bay (Trelease, 1954, 2008); Muir Glacier (Coville and Kearney, 674); Point Gustavus (Coville and Kearney, 783); Orca (Setchell, 1202; Trelease, 2011); Farragut Bay (Trelease, 1994); New Metlakatla (Trelease, 1993); Head of Russell Fiord (Coville and Kearney, 947, 957a); Sitka (Setchell, 1261; Trelease, 2001, 2006; W. G. Wright, 1606; J. M. Macoun); Hot Springs (Trelease, 2004); Kodiak (L. J. Cole); Wood Island (Brewer and Coe, 661).

Hylocomium triquetrum Br. eur., fasc. 49-52, p. 8, pl. 5.

From Skagway (Canby, 425); Disenchantment Bay (Trelease, 1915); Farragut Bay (Coville and Kearney, 467); Point Gustavus (Coville and Kearney, 789); Tongas Village (Brewer and Coe, 703); Kodiak (Trelease, 1920 in part, 1921, 1933); Sitka (Trelease, 1913);

Canby, 427, 448) ; Hall Island (Trelease, 1989) ; St. Paul Island (U. S. S. *Albatross* Exped.).

HYLOCOMIUM TRIQUETRUM BERINGIANUM var. nov.

Colore lutescente foliisque erecto-imbricatis, subhomomallis, minus papillois distinctum.

From Hall Island (Trelease, 1989 in part ; Coville and Kearney, 2059).

Hylocomium rugosum De Not. Epil., 99.

From Skagway (Canby, 483 in part).

POSTSCRIPT.

NOTE 1.—Since the completion of this paper for the press, in March, 1901, a very important catalogue of the bryophytes of the Yukon, comprising 24 hepatics, 7 sphagna, and 222 mosses, has been published by Mr. R. S. Williams, in the *Bulletin of the New York Botanical Garden*. Mr. Williams's list includes a large number of mosses that are here indicated as new to Alaska. The following species, however, to the number of fifty, are not found in Mr. Williams's list :

| | |
|-----------------------------|-----------------------------|
| Rhabdoweisia fugax, | Webera annotina, |
| Aongstroemia longipes, | Bryum bimum, |
| Dicranella grevilleana, | B. pallens, |
| Dicranum anderssonii, | Mnium insigne, |
| Hypnum callichroum, | M. nudum, |
| H. dieckii, | Aulacomnium androgynum, |
| H. subeugyrium, | Oligotrichum integrifolium, |
| D. starkei, | Fontinalis patula, |
| D. albicans, | Pterygophyllum lucens?, |
| D. groenlandicum, | Orthothecium intricatum, |
| D. neglectum, | Pseudoleskea atrovirens, |
| D. howellii, | P. stenophylla, |
| Dicranodontium longirostre, | Brachythecium novæ-angliæ, |
| D. aristatum, | B. asperillum, |
| Ditrichum homallum, | B. plumosum, |
| Barbula aciphylla, | Eurhynchium stokesii, |
| Grimmia maritima, | E. oreganum, |
| G. elatior forma?, | Rhynchostegium serrulatum, |
| Amphoridium mougeotii, | Plagiothecium sylvaticum, |
| Orthotrichum arcticum, | P. roeseanum, |
| Tayloria tenuis, | P. muehlenbeckii, |
| Splachnum luteum, | P. elegans, |
| Philonotis macounii, | Amblystegium serpens, |
| P. capillaris, | A. varium, |
| Meesea tschutschica, | Hylocomium umbratum. |

Of the species and varieties here described as new only one, *Hypnum plesiostramineum*, may possibly be identical with one of Mr. Williams's new species, *H. amblyphyllum*.

It should also be added that Mr. Williams's list contains 115 species not found in our list, so that at present the total number of mosses unquestionably shown to be Alaskan or of the Bering Sea islands is about 350.

NOTE 2 (p. 326).—In a recent paper in the Journal of Botany, vol. 39, pp. 339-341, Mr. E. S. Salmon points out that *Bartramiopsis lescurii* has the same leaf structure as *Lyellia crispa*, and he suggests placing it in this genus. But *Bartramiopsis* differs from *Lyellia* by its small, erect, symmetrical, not angular and macrostomate capsule, and it seems preferable to keep it as a distinct genus.

NOTE 3 (p. 343).—A preliminary diagnosis of this moss has been published by Mr. Renauld in Bryologist, iv, p. 65. It is perhaps the same species as *H. amblyphyllum* Williams, in Bull. N. Y. Bot. Garden, 11, p. 139.

June, 1902.

PLATE XIII.

NOTE.—Nachet's objectives 1, 3 and 5, oculars 1 and 2, with camera lucida. All drawings are reduced $\frac{1}{4}$ in photo-engraving. The magnification figures here printed are true for the drawings as printed.

FIGS. 1, *a-i*. *Cynodontium treleasei*.

- 1, *a*. Entire plant, natural size.
- 1, *b*. Leaf ($\times 34$).
- 1, *c*. Apex of the leaf ($\times 135$).
- 1, *d*. Perichæatial leaf ($\times 34$).
- 1, *e*. Capsule ($\times 13$).
- 1, *f*. Lid ($\times 30$).
- 1, *g*. Basal areolation of the leaf ($\times 135$).
- 1, *h*. Marginal areolation in the middle ($\times 270$).
- 1, *i*. Areolation in the upper part ($\times 270$).

2, *a-b*. *Dichodontium pellucidum kodiakanum*.

- 2, *a*. Leaves ($\times 13$).
- 2, *b*. Apex of the leaf ($\times 60$).

3, *a-f*. *Dicranum subflagellare*.

- 3, *a*. Entire plant, natural size.
- 3, *b*. Leaf ($\times 26$).
- 3, *c*. Apex of the same ($\times 135$).
- 3, *d*. Basal areolation ($\times 135$).
- 3, *e*. Areolation in the middle of a leaf ($\times 270$).
- 3, *f*. Areolation in the upper part ($\times 270$).

4, *a-e*. *Trichostomum cuspidatissimum*.

- 4, *a*. Entire plant, natural size.
- 4, *b, b*. Leaves ($\times 35$).
- 4, *c*. Basal areolation ($\times 135$).
- 4, *d*. Areolation in the middle of a leaf ($\times 135$).
- 4, *e*. Areolation of the upper part ($\times 135$).



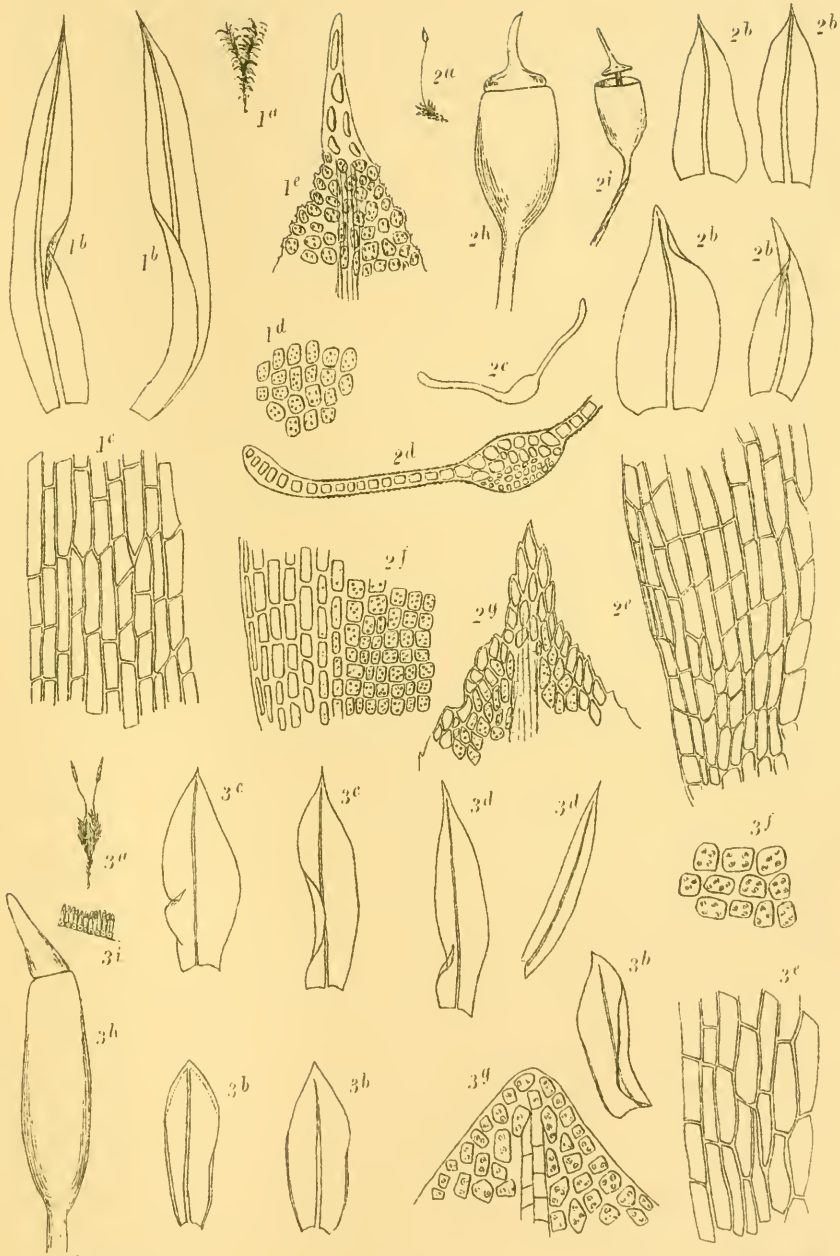
J. M. Smith det.

W. H. R. det.



PLATE XIV.

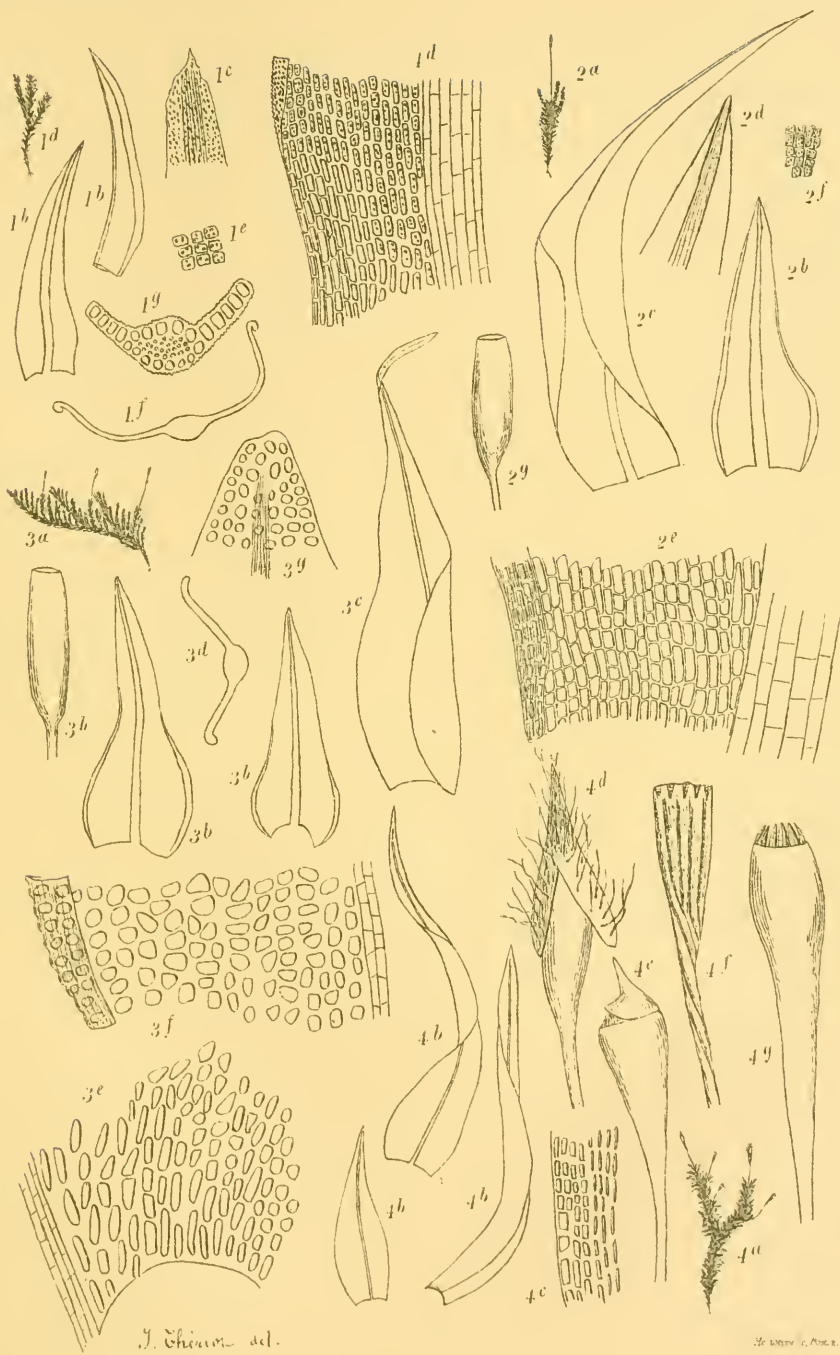
- FIGS. 1, *a-e*. *Trichostomum sitkanum*.
 1, *a*. Entire plant, natural size.
 1, *b, b*. Leaves ($\times 13$).
 1, *c*. Basal areolation of a leaf ($\times 135$).
 1, *d*. Areolation in the middle ($\times 135$).
 1, *e*. Areolation in the upper part ($\times 135$).
 2, *a-i*. *Pottia heimii beringiana*.
 2, *a*. Entire plant, natural size.
 2, *b, b, b, b*. Leaves ($\times 13$).
 2, *c*. Transverse section of a leaf ($\times 60$).
 2, *d*. Part of the same ($\times 135$).
 2, *e*. Basal areolation of the leaf ($\times 135$).
 2, *f*. Areolation in the middle ($\times 135$).
 2, *g*. Areolation of the apex ($\times 135$).
 2, *h*. Capsule in moist state ($\times 13$).
 2, *i*. Capsule ripe, in dry state ($\times 13$).
 3, *a-i*. *Barbula brachypoda*.
 3, *a*. Entire plant, natural size.
 3, *b, b, b*. Lower leaves ($\times 13$).
 3, *c, c*. Upper leaves ($\times 13$).
 3, *d, d*. Perichætil leaves ($\times 13$).
 3, *e*. Basal areolation of the leaf ($\times 135$).
 3, *f*. Areolation in the middle ($\times 135$).
 3, *g*. Areolation of the upper part ($\times 135$).
 3, *h*. Capsule in moist state ($\times 13$).
 3, *i*. Portion of the annulus ($\times 60$).



J. Thériault del.

PLATE XV.

- FIGS. 1, *a-g.* *Barbula rigens.*
- 1, *a.* Entire plant, natural size.
 - 1, *b, b.* Leaves ($\times 26$).
 - 1, *c.* Apex of a leaf ($\times 135$).
 - 1, *d.* Basal areolation ($\times 135$).
 - 1, *e.* Cells in the middle of a leaf ($\times 135$).
 - 1, *f.* Transverse section of the leaf in the lower part ($\times 135$).
 - 1, *g.* Transverse section of the leaf in the upper part ($\times 180$).
- 2, *a-g.* *Barbula treleasei.*
- 2, *a.* Entire plant, natural size.
 - 2, *b.* Leaf ($\times 26$).
 - 2, *c.* Perichætil leaf ($\times 26$).
 - 2, *d.* Apex of the stem leaf ($\times 60$).
 - 2, *e.* Basal areolation of same ($\times 135$).
 - 2, *f.* Cells in middle of same ($\times 135$).
 - 2, *g.* Old capsule in dry state ($\times 13$).
- 3, *a-h.* *Rhacomitrium cyclodictyon.*
- 3, *a.* Entire plant, natural size.
 - 3, *b, b.* Leaves ($\times 26$).
 - 3, *c.* Perichætil leaf ($\times 26$).
 - 3, *d.* Transverse section of a stem leaf ($\times 100$).
 - 3, *e.* Basal areolation of same ($\times 270$).
 - 3, *f.* Areolation in the middle ($\times 270$).
 - 3, *g.* Areolation of the apex ($\times 135$).
 - 3, *h.* Old capsule in moist state ($\times 13$).
- 4, *a-g.* *Ulota alaskana.*
- 4, *a.* Entire plant, natural size.
 - 4, *b, b, b.* Leaves ($\times 13$).
 - 4, *c.* Marginal areolation in the lower part ($\times 135$).
 - 4, *d.* Capsule and calyptra ($\times 13$).
 - 4, *e.* Capsule and lid ($\times 13$).
 - 4, *f.* Capsule ripe, in dry state ($\times 13$).
 - 4, *g.* Same, in moist state ($\times 13$).



J. Schimper del.

Dr. Schimper, Proc. B.

PLATE XVI.

- FIGS. 1, *a-i*. *Barbula saundersii*.
 1, *a*. Entire plant, natural size.
 1, *b*. Leaf ($\times 26$).
 1, *c*. Apex of the same ($\times 60$).
 1, *d*. Part of a transverse section of the same ($\times 100$).
 1, *e*. Perichætil leaf ($\times 26$).
 1, *f*. Basal areolation of a stem-leaf ($\times 135$).
 1, *g*. Cells in the middle of the same ($\times 270$).
 1, *h*. Capsule and lid ($\times 13$).
 1, *i*. Capsule and peristome ($\times 13$).
 2, *a-n*. *Orthotrichum fenestratum*.
 2, *a*. Entire plant, natural size.
 2, *b, b, b*. Leaves ($\times 13$).
 2, *c*. Transverse section of a leaf ($\times 60$).
 2, *d*. Transverse section of the costa ($\times 270$).
 2, *e*. Basal areolation of a leaf ($\times 135$).
 2, *f*. Areolation in the middle ($\times 135$).
 2, *g*. Areolation of the apex ($\times 135$).
 2, *h*. Capsule and lid ($\times 13$).
 2, *i*. Calyptra ($\times 13$).
 2, *j*. Capsule, deoperculate, in moist state ($\times 13$).
 2, *k*. The same split lengthwise ($\times 13$).
 2, *l*. A stoma ($\times 135$).
 2, *m*. A tooth of the peristome ($\times 135$).
 2, *n*. Upper part of the same ($\times 270$).

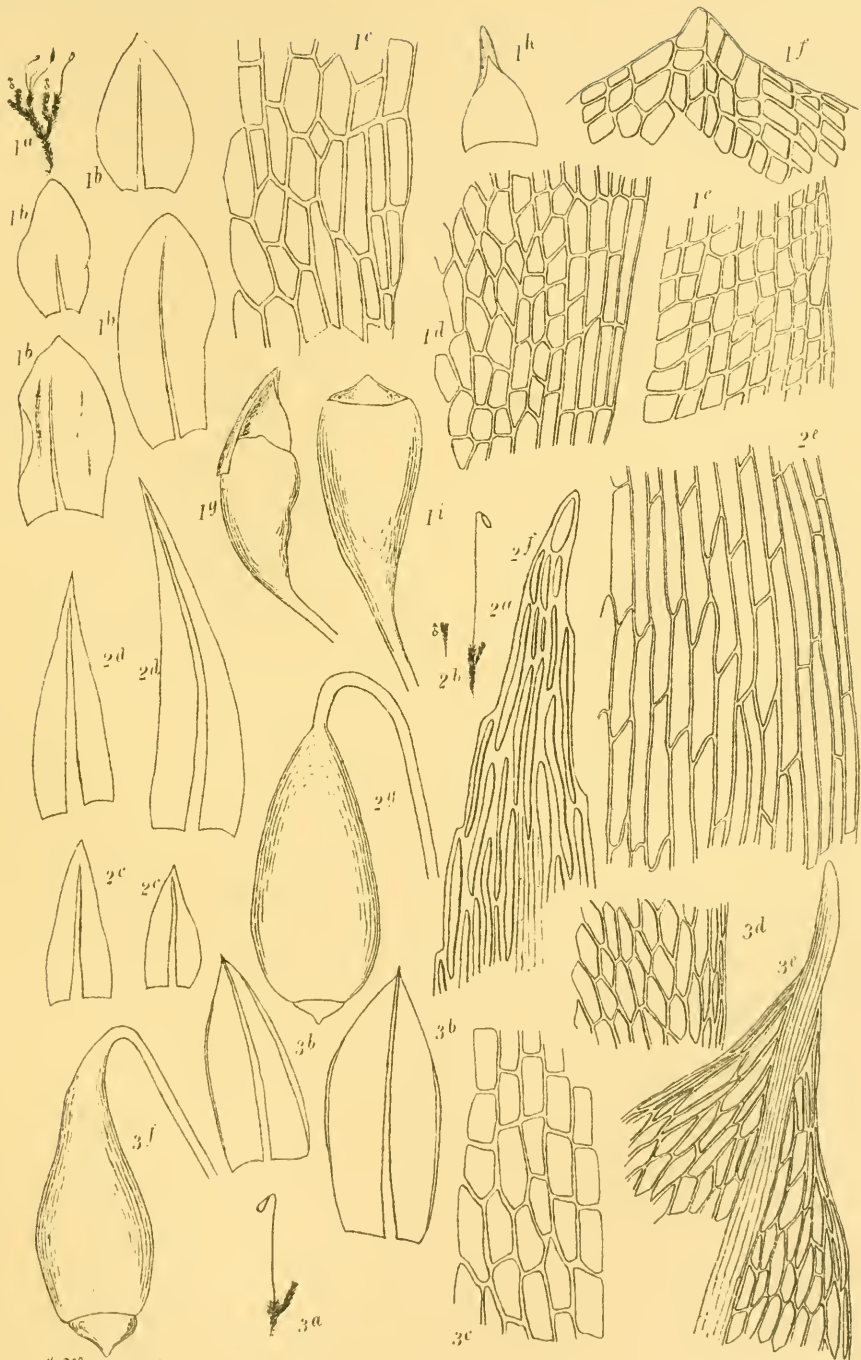


J. Chertov del

Hedberg & Co. Boston

PLATE XVII.

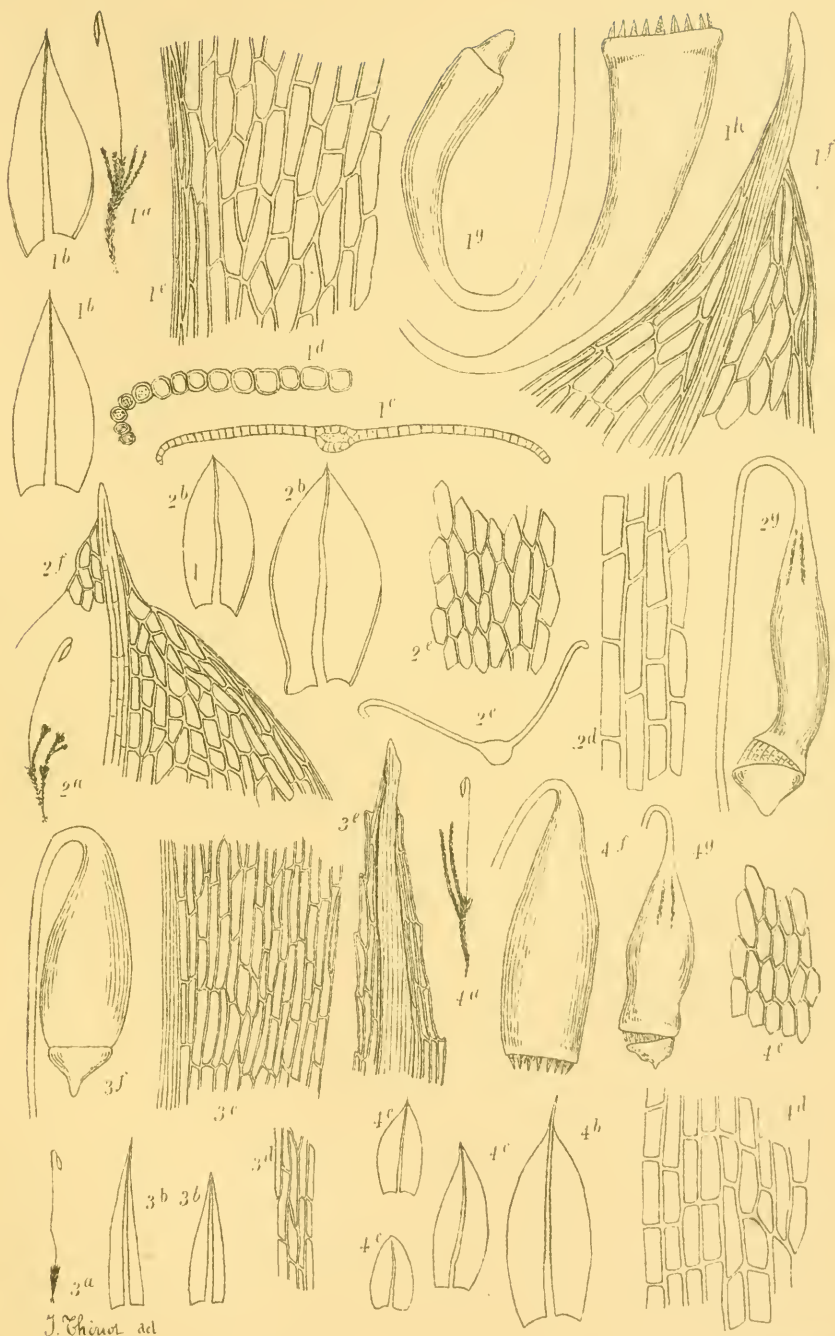
- FIGS. 1, *a-i*. *Entosthodon spathulifolius*.
 1, *a*. Entire plant, natural size.
 1, *b, b, b, b*. Leaves ($\times 13$).
 1, *c*. Basal areolation of a leaf ($\times 135$).
 1, *d*. Areolation in the lower part ($\times 135$).
 1, *e*. Areolation in the upper part ($\times 135$).
 1, *f*. Areolation of the apex ($\times 135$).
 1, *g*. Capsule and calyptra ($\times 13$).
 1, *h*. Calyptra ($\times 13$).
 1, *i*. Capsule, unripe ($\times 13$).
 2, *a-g*. *Webera pseudo-gracilis*.
 2, *a*. Female plant, natural size.
 2, *b*. Male plant, natural size.
 2, *c, c*. Lower leaves ($\times 26$).
 2, *d, d*. Upper leaves ($\times 26$).
 2, *e*. Basal areolation of a leaf ($\times 270$).
 2, *f*. Areolation of the apex ($\times 270$).
 2, *g*. Capsule unripe ($\times 13$).
 3, *a-f*. *Bryum mucronigerum*.
 3, *a*. Entire plant, natural size.
 3, *b, b*. Leaves ($\times 13$).
 3, *c*. Basal areolation of a leaf ($\times 135$).
 3, *d*. Areolation in the middle ($\times 135$).
 3, *e*. Areolation of the apex ($\times 135$).
 3, *f*. Capsule unripe ($\times 13$).



J. Thériot del

PLATE XVIII.

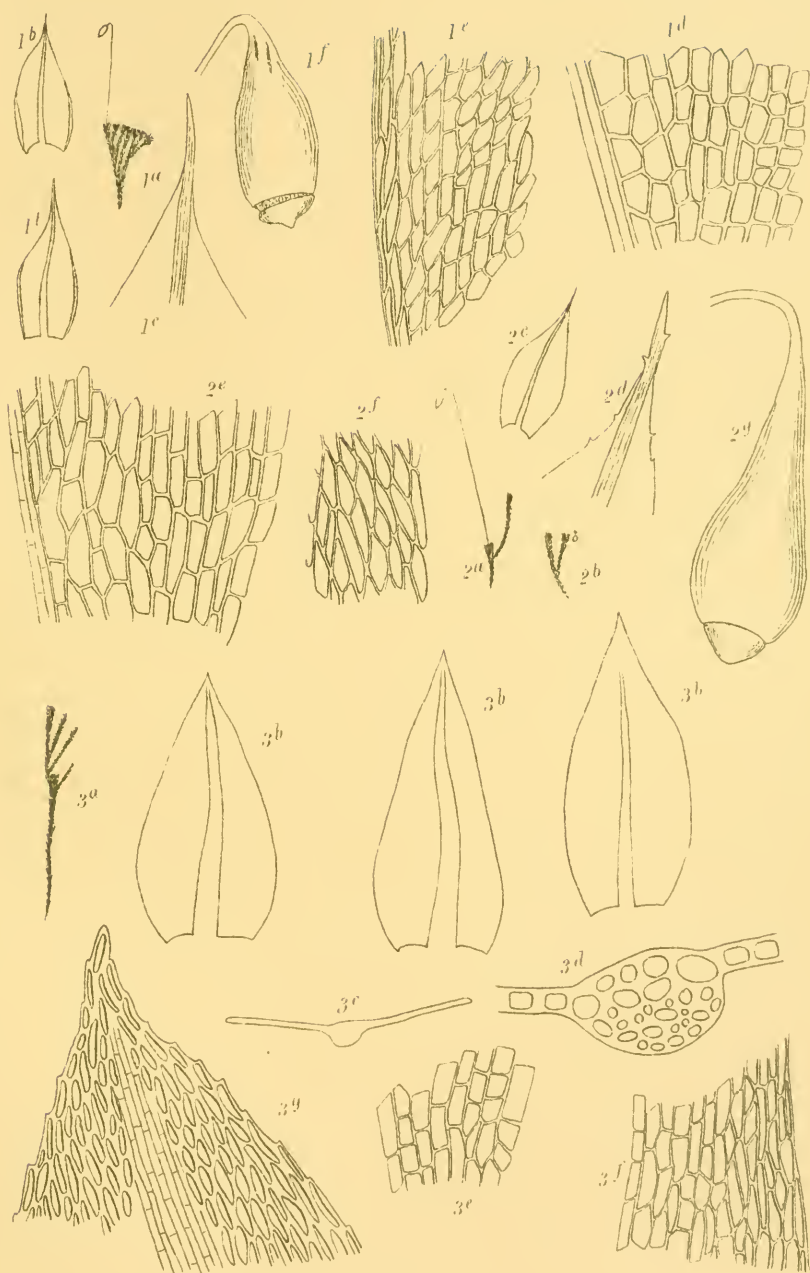
- FIGS. 1, *a-h.* *Bryum drepanocarpum.*
 1, *a.* Entire plant, natural size.
 1, *b, b.* Leaves ($\times 13$).
 1, *c.* Transverse section of a leaf ($\times 60$).
 1, *d.* Part of the same ($\times 135$).
 1, *e.* Marginal areolation in the middle of a leaf ($\times 135$).
 1, *f.* Areolation of the apex ($\times 135$).
 1, *g.* Young capsule ($\times 13$).
 1, *h.* Capsule ripe, in dry state ($\times 13$).
 2, *a-g.* *Bryum cylindrico-arcuatum.*
 2, *a.* Entire plant, natural size.
 2, *b, b.* Leaves ($\times 13$).
 2, *c.* Transverse section of a leaf ($\times 60$).
 2, *d.* Basal areolation ($\times 135$).
 2, *e.* Cells in the middle of a leaf ($\times 135$).
 2, *f.* Areolation of the apex ($\times 135$).
 2, *g.* Capsule in dry state ($\times 13$).
 3, *a-f.* *Bryum leptodictyon.*
 3, *a.* Entire plant, natural size.
 3, *b, b.* Leaves ($\times 13$).
 3, *c.* Basal areolation ($\times 135$).
 3, *d.* Cells in the middle of a leaf ($\times 135$).
 3, *e.* Areolation of the apex ($\times 135$).
 3, *f.* Capsule in moist state ($\times 13$).
 4, *a-g.* *Bryum pseudo-stirtoni.*
 4, *a.* Entire plant, natural size.
 4, *b.* Stem-leaf ($\times 13$).
 4, *c, c, c.* Branch-leaves ($\times 13$).
 4, *d.* Basal areolation ($\times 135$).
 4, *e.* Cells in the middle of a leaf ($\times 135$).
 4, *f.* Capsule ripe, in moist state ($\times 13$).
 4, *g.* Capsule in dry state ($\times 13$).



J. Chino ad

PLATE XIX.

- FIGS. 1, *a-f.* *Bryum ateleostomum*.
1, *a.* Entire plant, natural size.
1, *b, b.* Leaves ($\times 13$).
1, *c.* Apex of a leaf ($\times 60$).
1, *d.* Basal areolation of the same ($\times 135$).
1, *e.* Marginal areolation, in the middle ($\times 135$).
1, *f.* Capsule ripe, in dry state ($\times 13$).
2, *a-g.* *Bryum heterogynum*.
2, *a.* Female plant, natural size.
2, *b.* Male plant, natural size.
2, *c.* Leaf of the female plant ($\times 13$).
2, *d.* Apex of the same ($\times 60$).
2, *e.* Basal areolation ($\times 135$).
2, *f.* Cells in the middle ($\times 135$).
2, *g.* Young capsule in dry state ($\times 13$).
3, *a-g.* *Bryum laurentianum*.
3, *a.* Entire plant, natural size.
3, *b, b.* Stem-leaves ($\times 26$).
3, *b'.* Branch-leaf ($\times 26$).
3, *c.* Transverse section of a leaf ($\times 60$).
3, *d.* Transverse section of the costa ($\times 270$).
3, *e.* Basal areolation ($\times 135$).
3, *f.* Marginal areolation in the middle ($\times 135$).
3, *g.* Areolation of the apex ($\times 135$).



J. Schiner del

PLATE XX.

1, *a-g.* *Bryum treleasei*.

1, *a.* Entire plant, natural size.

1, *b, b.* Leaves ($\times 13$).

1, *c, c.* Transverse section of a leaf ($\times 135$).

1, *d.* Basal areolation of the same ($\times 135$).

1, *e.* Marginal areolation in the lower part ($\times 135$).

1, *f.* Areolation of the apex ($\times 135$).

1, *g.* Young capsule, in moist state ($\times 13$).

2, *a-h.* *Bryum agattuense*.

1, *a.* Entire plant, natural size.

1, *b, b.* Stem-leaves ($\times 13$).

2, *c.* Branch-leaf ($\times 13$).

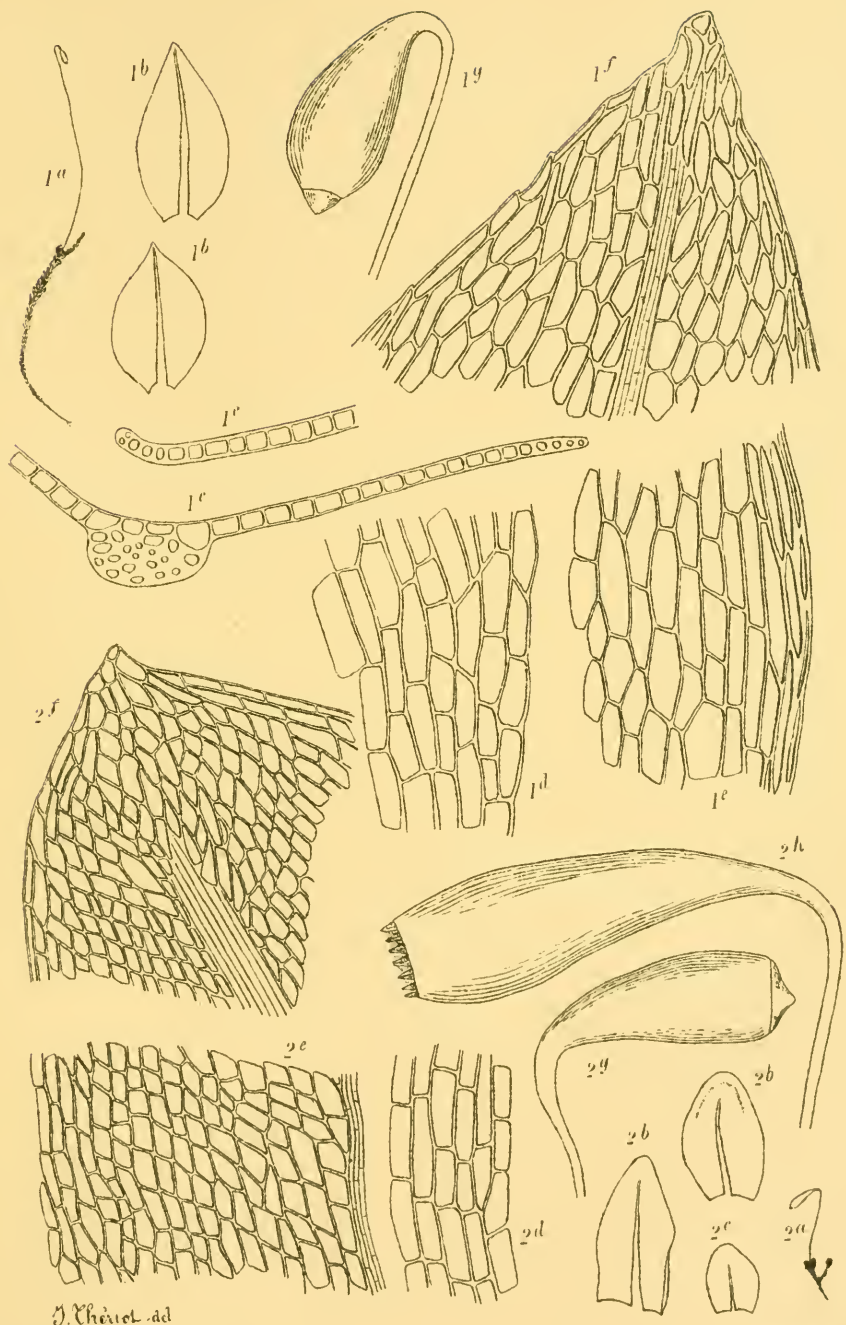
2, *d.* Basal areolation ($\times 135$).

2, *e.* Areolation in the middle ($\times 135$).

2, *f.* Areolation of the apex ($\times 135$).

2, *g.* Capsule unripe, in dry state ($\times 13$).

2, *h.* Capsule ripe, in moist state ($\times 13$).



D. Chetani ad

U. Chetani ad

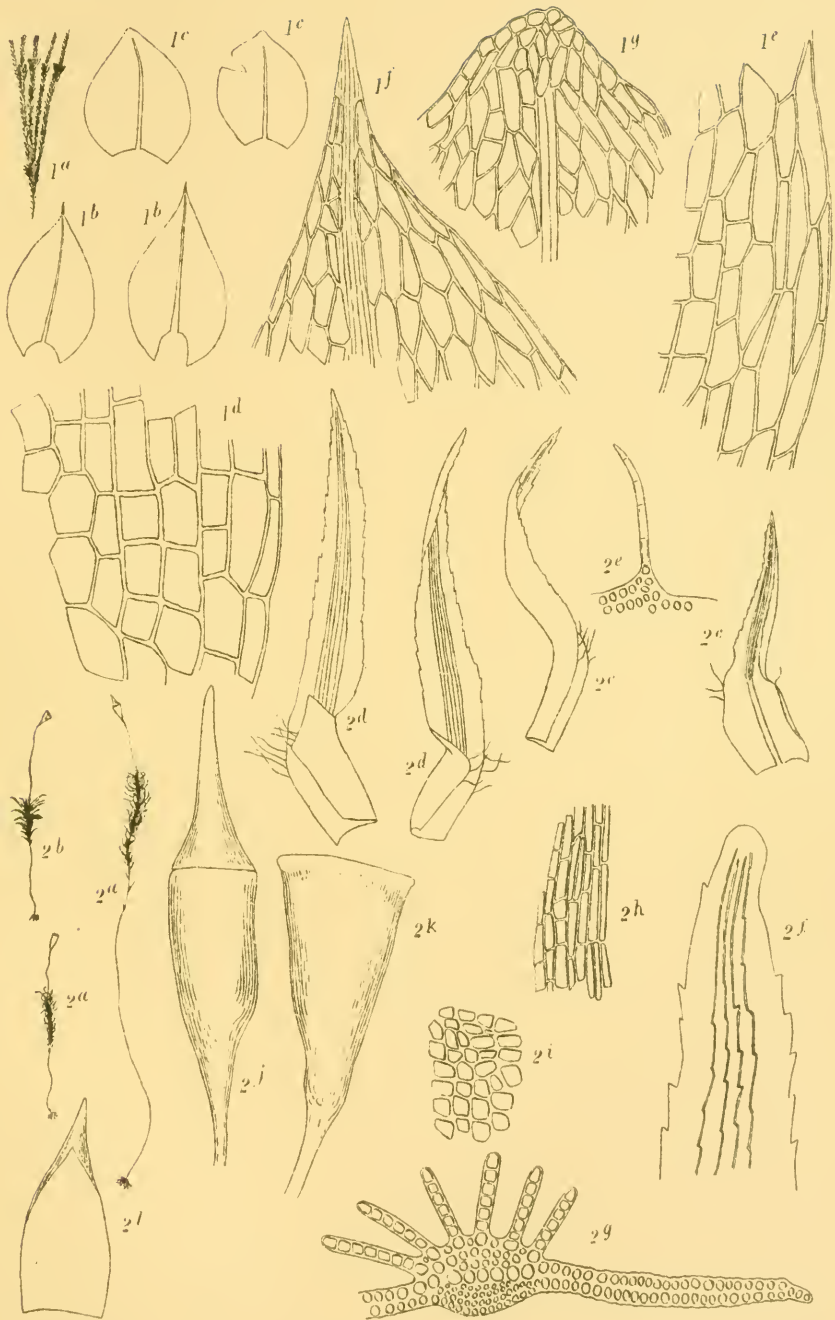
PLATE XXI.

FIGS. 1, *a-g*. *Bryum harrimani*.

- 1, *a*. Entire plant, natural size.
- 1, *b, b*. Lower leaves ($\times 13$).
- 1, *c, c*. Upper leaves ($\times 13$).
- 1, *d*. Basal areolation ($\times 135$).
- 1, *e*. Marginal areolation, in the middle ($\times 135$).
- 1, *f*. Apex of a lower leaf ($\times 135$).
- 1, *g*. Apex of an upper leaf ($\times 135$).

2, *a-l*. *Bartramioopsis lescurii*.

- 2, *a, a*. Entire plant, natural size, in dry state.
- 2, *b*. The same, in moist state.
- 2, *c, c*. Lower leaves ($\times 13$).
- 2, *d, d*. Upper leaves ($\times 13$).
- 2, *e*. Cilium of a leaf ($\times 135$).
- 2, *f*. Apex of a leaf, seen on the ventral side ($\times 60$).
- 2, *g*. Transverse section of a leaf ($\times 135$).
- 2, *h*. Basal areolation ($\times 135$).
- 2, *i*. Cells in the lower part of the leaf ($\times 270$).
- 2, *j*. Capsule and lid ($\times 13$).
- 2, *k*. Capsule ripe, in dry state ($\times 13$).
- 2, *l*. Calyptra ($\times 13$).



J. Thériot. del.

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PLATE XXII.

- FIGS. 1, *a-f.* *Polytrichum yukonense.*
 1, *a.* Entire plant, natural size.
 1, *b, b.* Leaves ($\times 13$).
 1, *c.* Transverse section of a leaf ($\times 34$).
 1, *d.* Transverse section of a lamella ($\times 135$).
 1, *e.* Part of a lamella seen from side ($\times 270$).
 1, *f.* Basal areolation of the leaf ($\times 135$).
 2, *a.* *Polytrichum jensenii.*
 2, *a.* Basal areolation of the leaf ($\times 135$).
 3, *a-e.* *Brachythecium beringianum.*
 3, *a.* Entire plant, natural size.
 3, *b.* Stem leaf ($\times 26$).
 3, *c, c.* Branch-leaves ($\times 26$).
 3, *d.* Basal areolation ($\times 135$).
 3, *e.* Cells in the middle ($\times 270$).
 4, *a-e.* *Plagiothecium fallax.*
 4, *a.* Entire plant, natural size.
 4, *b.* Leaf ($\times 13$).
 4, *c.* Perigonal leaf ($\times 26$).
 4, *d.* Basal areolation of a leaf ($\times 135$).
 4, *e.* Areolation in the middle ($\times 135$).
 5, *a-e.* *Hypnum treleasei.*
 5, *a.* Entire plant, natural size.
 5, *b, b, b.* Leaves ($\times 26$).
 5, *d.* Basal areolation of a leaf ($\times 270$).
 5, *e.* Cells in the middle ($\times 270$).

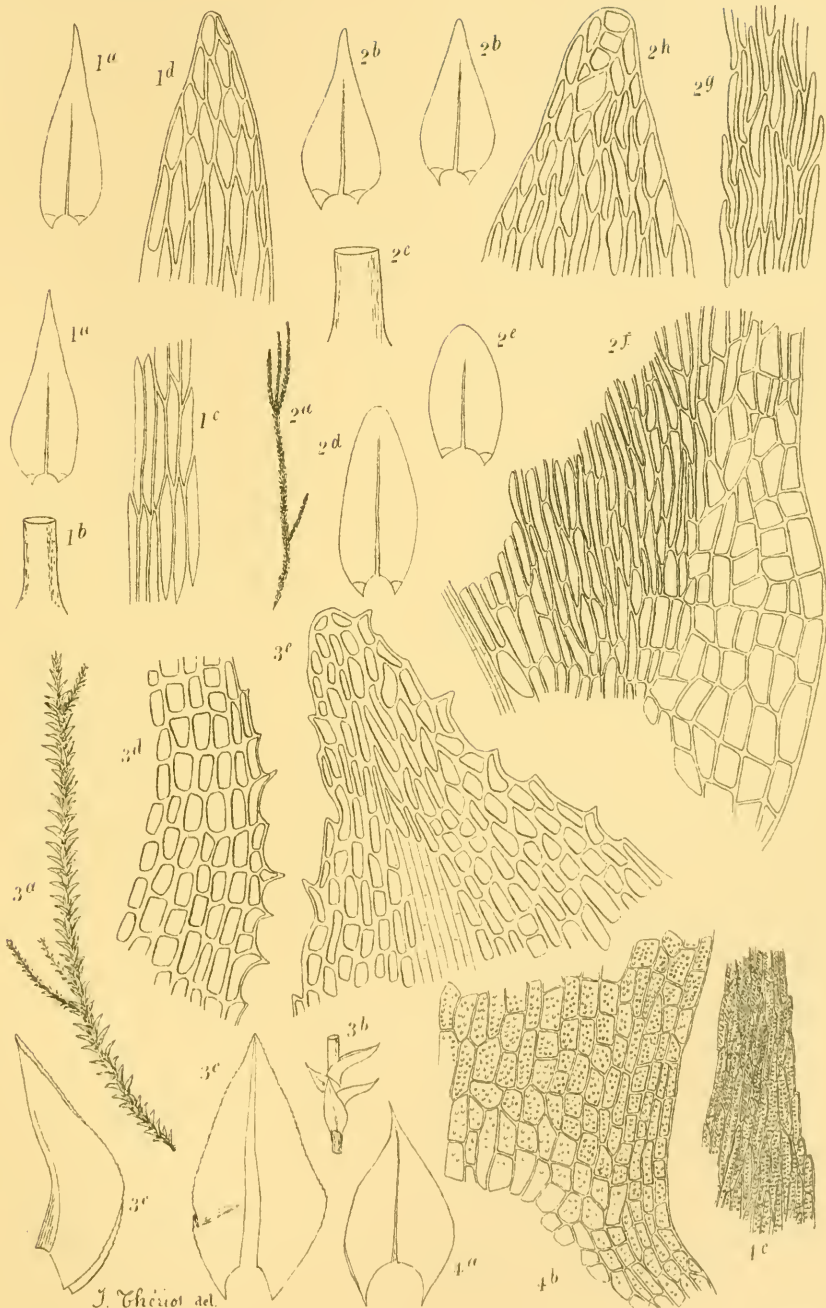


J. Thuret del

PLATE XXIII.

FIGS. 1, *a-d*. *Hypnum pseudostramineum*.

- 1, *a, a*. Leaves ($\times 18$).
- 1, *b*. Lower part of the costa ($\times 130$).
- 1, *c*. Areolation in the middle of a leaf ($\times 225$).
- 1, *d*. Areolation of the apex of a leaf ($\times 225$).
- 2, *a-h*. *Hypnum plesiostramineum*.
- 2, *a*. Entire plant, natural size.
- 2, *b, b*. Lower leaves ($\times 18$).
- 2, *c*. Lower part of the costa ($\times 130$).
- 2, *d*. Upper leaf ($\times 18$).
- 2, *e*. Branch leaf ($\times 18$).
- 2, *f*. Auricle and basal areolation of a leaf ($\times 225$).
- 2, *g*. Cells in the middle ($\times 225$).
- 2, *h*. Areolation of the apex ($\times 225$).
- 3, *a-c*. *Meesea tschutschica*.
- 3, *a*. Entire plant, natural size.
- 3, *b*. Part of a stem ($\times 3$).
- 3, *c, c*. Leaves ($\times 13$).
- 3, *d*. Marginal areolation in the middle ($\times 135$).
- 3, *e*. Areolation of the apex ($\times 135$).
- 4, *a-c*. *Brachythecium reflexum pacificum*.
- 4, *a*. Stem-leaf ($\times 13$).
- 4, *b*. Basal areolation ($\times 135$).
- 4, *c*. Marginal areolation in the middle ($\times 135$).



J. Thériot del.

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INDEX

NOTE.—New species and varieties in **black face** type.

- Alsia abietina* 331
Amblystegium serpens 337, 346
 serpens beringianum 338
 varium alaskanum 338, 346
Amphoridium lapponicum 309
 mougeotii 309, 346
Andreaea papillosa 294
 parvifolia 294
 petrophila 294
 petrophila sylvicola 294
Anoetangium compactum 294
 compactum alaskanum 294
Antitrichia californica 331
 curtipendula 331
 curtipendula gigantea 331
Aongstræmia longipes 297, 346
Atrichum parallelum 326
Aulacomnium androgynum 325, 346
 palustre 325
 turgidum 325

Barbula aciphylla 306, 346
 brachypoda 303
 cylindrica 305
 fragilis 305
 rigens 305
 ruralis 306
 saundersii 304
 subcuneifolia 306
 treleasei 305
Bartramia breviseta 314
 circinnulata 314
 ithyphylla 313
 ithyphylla strigosa 313
 menziesii 314
 œderi 314
 pomiformis 313
 subulata 314
Bartramiopsis lescurii 325
Blindia acuta 300
 acuta flexipes 300
Brachythecium albicans 334
 asperillum 335, 346
 beringianum 333
 lamprochryseum giganteum 335
 novæ-angliæ 334, 346
 plumosum 335, 346
 reflexum 333
 reflexum pacificum 335
 rivulare 334

Brachythecium—Continued
 salebrosum 334
Bryum acutiusculum 321
 agattuense 318
 alaskanum 323
 argenteum 319
 ateleostomum 317
 bimum 319, 346
 brachyneuron 323
 bullatum 323
 cæspitium 321
 capillare 323
 cylindrico-arcuatum 319
 drepanocarpum 322
 duvalii 322
 duvalii obtusatum 322
 erythrophyllum 323
 fallax 323
 froudei 323
 harrimani 322
 heterogynum 320
 inclinatum 318
 lacustre 323
 laurentianum 320
 leptodictyon 320
 meeseoides 323
 microstegioides 323
 mucronigerum 318
 obtusifolium 323
 pallens 321, 346
 pallescens 319
 pendulum 323
 pseudostirtoni 321
 pseudotriquetrum 322
 stenotrichum 318
 submuticum 323
 suborbiculare 323
 treleasei 318
 wrightii 323

Camptothecium lutescens 333
 nitens 333
Campylopus schimperi 300
Ceratodon heterophyllum 301
 purpureus 301
Claopodium bolanderi 333
 crispifolium 333
 laxifolium 333
Climacium dendroides 331
 ruthenicum 332

- Conostomum boreale* 314
Coscinodon pulvinatus 309
Cynodontium polycarpum alaskanum 296
 torquescens 295
 treleasei 295
 virens 296
 virens serratum 296
 wahlenbergii 296

Desmatodon latifolius 303
Dichodontium pellucidum 296
 pellucidum fagimontanum 296
 pellucidum kodiakanum 297
 pellucidum serratum 297
Dicranella crispa 297
 grevilleana 297, 346
 heteromalla 297
 heteromalla latinervis 297
 heteromalla orthophylla 297
 polaris 297
 rufescens 297
 squarrosa 297
 subulata 297
Dicranodontium aristatum 300, 346
 longirostre 300, 346
Dicranoweisia crispula 294
Dicranum albicans 298, 346
 anderssonii 298, 346
 bergeri 300
 bonjeani 300
 dipteroneuron 299
 elongatum 298
 fuscescens 299
 groenlandicum 298, 346
 howellii 300, 346
 hyperboreum 297
 majus 300
 molle 300
 neglectum 299, 346
 scoparium 299
 starkei 298, 346
 strictum 298
 subflagellare 298
Didymodon baden-powellii 302
 rubellus 302
Dissodon splachnoides 312
Distichium capillaceum 301
Ditrichum flexicaule densum 301
 glaucescens 301
 homallum 301, 346

Encalypta alaskana 311
 commutata 311
 macounii 311
 rhabdocarpa 311
 vulgaris 311
Entosthodon spatulifolius 312
Eurhynchium cirrosum 336
 myosuroides 335
 myosuroides humile 336
 myosuroides spiculiferum 336

Eurhynchium—Continued
 myosuroides stoloniferum 336
 oreganum, 336, 346
 stokesii 336, 346
 stokesii pseudo-speciosum 336
 strigosum fallax 336
 strigosum typicum 336
 vaucheri 336

Fontinalis patula 330, 346
Funaria hygrometrica 313
 hygrometrica calvescens 313

Grimmia apocarpa 306
 apocarpa alpicola 306
 apocarpa gracilis 306
 apocarpa rivularis 306
 conferta 306
 elator 307, 346
 maritima 306, 346
 torquata 307
Gymnostomum curvirostre scabrum 294

Hylacomium loreum 345
 rugosum 346
 splendens 344
 splendens gracilius 344
 squarrosus 345
 triquetrum 345
 triquetrum beringianum 346
 umbratum 345, 346
Hypnum aduncum 339
 alaskæ 341
 alaskanum 344
 callichroum 341, 346
 canadense 342
 circinale 341
 cordifolium 343
 crista-castrensis 341
 dieckii 342, 346
 filicinum 340
 fluitans 339
 fluitans alpinum 339
 fluitans exannulatum 339
 hamulosum 342
 krausei 343
 ochraceum 342
 ochraceum flaccidum 342
 plesiostramineum 343
 polygamum 339
 pseudo-complexum 344
 revolvens 339
 sarmentosum beringianum 343
 schreberi 343
 stellatum 339
 stramineum 343
 subeugyrium occidentale 342, 346
 sulcatum stenodictyon 341
 treleasei 338
 uncinatum 339
 uncinatum breviseta 340

- Hypnum—Continued
 uncinatum plumosa 340
 uncinatum plumulosum 340
 uncinatum polare 340
 uncinatum subulaceum 340
 vaucheri 342
- Leptobryum pyriforme 315
 Leptotrichum tomentosum 301
 Leskea laxifolia 333
 Leucolepis acanthoneura 325
- Meesea tschutschica 315, 346
 uliginosa 315
- Mnium affine 323
 affine elatum 323
 cinclidioides 325
 glabrescens 324
 insigne 324, 346
 medium 323
 nudum 324, 346
 punctatum 324
 punctatum anceps 324
 rugicum 323
 spinulosum 324
 subglobosum 325
- Myurella julacea 331
 julacea scabrifolia 331
- Neckera douglassi 331
 menziesii 331
 pennata 331
- Oligotrichum aligerum 327
 integrifolium 327, 346
- Oreoweisia serrulata 295
- Orthothecium chryseum 332
 intricatum 332, 346
- Orthotrichum arcticum 310, 346
 fenestratum 310
 pulchellum 311
 speciosum 311
- Paludella squarrosa 315
- Philonotis capillaris 315, 346
 fontana 314
 fontana caespitosa 315
 macounii 314, 346
 seriata 315
 vancouveriensis 315
- Plagiothecium denticulatum 337
 denticulatum donii 337
 denticulatum recurvum 337
 denticulatum undulatum 337
 elegans 337, 346
 fallax 336
 muehlenbeckii 337, 346
 pulchellum 337
 roeseanum 337, 346
 sylvaticum 337, 346
 undulatum 336
- Pogonatum alpinum 328
- Pogonatum—Continued
 alpinum arcticum 329
 alpinum brevifolium 329
 alpinum macounii 328
 alpinum septentrionale 329
 alpinum simplex 329
 atrovirens 329
 capillare 327
 contortum 327
 dentatum 327
 microdontium 329
 urnigerum 328
- Polytrichum behringianum 330
 commune 329
 formosum 329
 gracile 329
 hyperboreum 330
 juniperinum 330
 piliferum 330
 sexangulare 330
 strictum 330
 yukonense 329
- Pottia heimii beringiana 301
- Pseudoleskea atrovirens 332, 346
 radicosa 332
 stenophylla 332, 346
- Psilopilum arcticum 327
- Pterygophyllum lucens 331, 346
- Rhabdoweisia fugax 295, 346
 fugax subdenticulata, 295
- Rhacomitrium aciculare 307
 canescens 309
 canescens ericoides 309
 cyclodictyon 308
 fasciculare 307
 heterostichum 308
 heterostichum affine 308
 lanuginosum 308
 nevii 307
 patens 307
 sudeticum alaskanum 307
 tenuinerve 307
- Rhynchoszegium serrulatum 336, 346
 subdemissum 336
- Scleropodium cespitosum 335
 colpophyllum 335
 illecebrum 335
 krausei 335
- Splachnum luteum 312, 346
 sphaericum 312
 vasculosum 312
 wormskjoldii 312
- Tayloria serrata 312
 tenuis 312, 346
- Tetraxis geniculata 311
 pellucida 311
- Tetraplodon mnioides 312
 mnioides cavifolius 312
 urceolatus 312
- Thuidium abietinum 333

- Timmia austriaca* 325
Trichostomum cuspidatissimum 302
 sitkanum 303
- Ulota alaskana* 309
 barclayi 310
 crispa subcalvescens 310
 drummondii 309
 phyllantha 309
- Webera albicans* 317
 albicans glacialis 317
 annotina 317, 346
- Webera*—Continued
 cruda 315
 crudoidea 317
 cucullata 316
 cucullatiformis 317
 drummondii 317
 nutans 315
 nutans bicolor 316
 nutans caespitosa 316
 nutans strangulata 316
 polymorpha 317
 proligera 317
 pseudogracilis 316

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[PLATES XXIV-XXV, TEXT FIGURES 5-21.]

PAPERS FROM THE HARRIMAN ALASKA
EXPEDITION.

XXX.

ANEMONES, WITH DISCUSSION OF VARIATION
IN METRIDIDIUM.

BY HARRY BEAL TORREY.

CONTENTS.

| | |
|---|-----|
| Introduction | 373 |
| Distribution | 374 |
| Systematic account | 375 |
| Variation in <i>Metridium</i> | 395 |

INTRODUCTION.

THIS report, which is based on the collection made by the Harriman Alaska Expedition, includes a systematic account of the Anemones collected. It also includes a description of a new Halcampid, *Harenactis attenuata*, from California, a discussion of the variation in *Metridium dianthus*, a few facts concerning *Epiactis prolifera*, Verrill, and figures, from photographs, of several previously described species. In the Alaskan collection six genera and six species are represented of which one genus, *Charisca*, and two species, *Charisca saxicola* and *Epiactis ritteri* are regarded as new to science and are here first described.

DISTRIBUTION.

Of the eight species here mentioned five have been collected only on the Pacific coast of North America. Of these five, three are new and each was found in but one locality, viz., *Epiactis ritteri* at Popof Island, *Charisea saxicola* at Sitka, and *Harenactis attenuata* at San Pedro.

Epiactis prolifera is common in Puget Sound and at several points on the California coast as far south as Pacific Grove, about one hundred miles south of San Francisco.

Cribrina (Evactis) artemisia is, so far as I know, not found south of Puget Sound, where it was originally discovered by Pickering, of the U. S. Exploring Expedition. The Harriman collections extend its known range along the Alaskan coast to Dutch Harbor.

Of the three species, not peculiar to the western coast of North America *Edwardsia sipunculoides* is the least widely distributed. It was originally described by Stimpson from a single living specimen taken at Grand Manan Island, New Brunswick, and has since been found in great abundance in the neighboring locality of Eastport, Maine, by Verrill.

These are the only places in which it is known to occur, with the possible exception of Henley Harbor, Labrador, where an imperfect specimen of an *Edwardsia* having twenty-four tentacles was dredged. This was noted by Packard in 1865. *E. sipunculoides* is clearly a northern species, and will probably be found at other points along the coast between Labrador and Alaska.

Urticina crassicornis is a circumboreal species, having a north temperate and arctic range. It is found on the Atlantic and northern shores of Europe, in Spitzbergen, Iceland, Greenland, on the Atlantic coast of North America south to Cape Cod, and on the northern and western coasts of North America south to Puget Sound.

Metridium dianthus has about the same distribution, reaching farther southward, however, in both Europe (Mediterranean) and America (Cape Hatteras and San Francisco).

SYSTEMATIC ACCOUNT.

Order ACTINIARIA.

Cœlenterata with mesenteries usually numerous and in some multiple of six; without spicular or continuous skeleton. Polyps either free, or adhering by means of pedal disk, or, rarely, fixed; for the most part solitary, occasionally forming colonies.

Tribe HEXACTINIÆ Hertwig.

Actiniaria with at least eight perfect mesenteries which correspond to the first eight mesenteries of the embryo; with a varying number of secondary mesenteries, four of which form, with the primaries, six more or less complete pairs; these constitute the first cycle, which may be augmented by two or four pairs of perfect mesenteries. To this first cycle may be added a number of additional cycles, perfect or imperfect, the mesenteries of which usually develop in pairs and radially, appearing almost simultaneously in all the intermesenterial spaces. The longitudinal (retractor) muscles of each pair face toward each other except in the case of two (or one or several). The directives, which are usually attached to the siphonoglyphs and whose retractors face away from each other, toward the adjacent intermesenterial spaces.

Order EDWARDSIÆ Hertwig.

Free-moving non-colonial *Actiniaria*, with eight primary perfect and a variable number of secondary rudimentary mesenteries. Of the primary mesenteries, two pairs are directives; the remaining four are unpaired and their retractor muscles face the same way; all are fertile. Tentacles simple, never more numerous than the mesenteries.

This is essentially the definition of Haddon modified to accord with the observations of Faurot and myself concerning the presence of secondary mesenteries in the Edwardsiidæ, a fact which will be discussed farther on.

The reincorporation of the Edwardsiæ into the Hexactiniæ has been necessitated—as Van Beneden and McMurrich have already decided—by the discovery of a true though primitive hexactinian arrangement of mesenteries in some species of the former group, *e. g.*, *E. beautempsi*. Whether this condition is primitive in *Edwardsia* or, as Van Beneden holds, has been secondarily produced by the simplification of a more complex hexactinian ancestor is a question which I do not think we are now in a position to decide. It seems probable,

however, that *Edwardsia*, as it exists to-day, cannot be the ancestral form of the Actinians whether the mesenterial arrangement is primitive or not. This statement would apply equally well to *Edwardsia* even though the rudimentary hexactinian mesenteries were absent.

On page 383 I have presented a scheme of the possible interrelationships of the different species of *Edwardsia* on the basis of mesenterial formulæ merely. Whether such a scheme truly expresses the phylogenetic development of the group remains to be seen.

Family EDWARDSIIDÆ Andres.

Genus *Edwardsia* Andres.

Physa well developed, retractile, adhesive. Number of tentacles variable, from fourteen to thirty-six, arranged in two cycles. Mesenteries equalling or surpassing the tentacles in number. Capsules containing nematocysts numerous, arranged in rows, or scattered.

From time to time since 1884 when Andres established this genus for the reception of four species of *Edwardsia* with twenty tentacles or more, including *E. sipunculoides*, the adequacy of the number of tentacles as a criterion of the genus has been questioned. At first sight it seems to separate forms with sixteen tentacles from those with twenty. It seems even more so when it is remembered that the species with sixteen tentacles typically may have but fourteen as in *E. beaumontsi* or fifteen as in *E. adenensis*. It was an appreciation of this difficulty which led Carlgren to suggest, in 1893, that the *arrangement* of the tentacles was of more fundamental importance than their *number*. With this idea in mind, he formulated three types of tentacular arrangement. At present we are concerned with but two of these, the so-called *Edwardsia* and *Edwardsiella* types. According to the

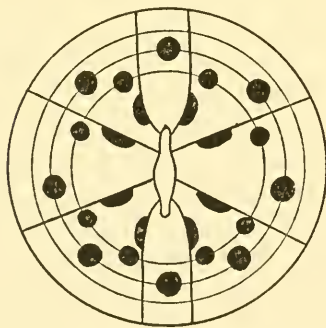


FIG. 5. *Edwardsia* type (Carlgren).

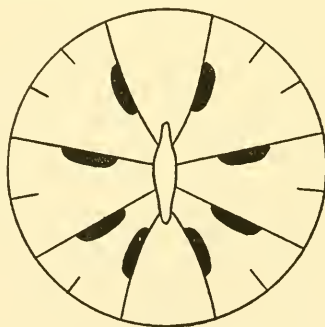


FIG. 6. Diagram showing arrangement of mesenteries in *Edwardsia* sp. (San Pedro).

Edwardsia type, the sixteen tentacles are arranged alternately in two cycles, the primary eight representing the outer, the other the inner cycle (fig. 5). So far as numerical grouping goes, the same plan obtains in an undescribed *Edwardsia* from San Pedro, Cal.; but I have been unable to detect any alternation of the tentacles at their bases, though in life eight bend inward and upward, alternating with eight which bend outward. Yet there is one interesting difference. In the San Pedro species and, I infer, in *E. beaulempsi*, the two groups of three tentacles open into the dorso-lateral primary enterocœls. In Carlgren's diagram these groups open into the ventro-lateral primary enterocœls. It is difficult to derive the hexamerous type from such a form. This leads me to suppose that Carlgren inadvertently figured the longitudinal muscle bands on the wrong sides of the mesenteries. Faurot, in 1895, seems to have found a like arrangement in *E. beaulempsi*, to judge from the arrangement of secondary mesenteries which he has figured.¹ For the latter agrees with the plan of the mesenteries in the San Pedro *Edwardsia* (fig. 6), in which one tentacle communicates with each intermesenterial space.

According to Carlgren's second or *Edwardsiella* type (fig. 7), the eight primary tentacles form the innermost cycle, one in each primary enterocœl. There are twelve tentacles in the second cycle, two in each primary enterocœl save in those bounded by the directives. The third cycle is external to the second. This type will not include *E. sipunculoides*, in which species there are two and only two distinct cycles, regardless of the number of tentacles; and the members of each cycle, at least in the cases where the number of tentacles equals the number of mesenteries, alternate with each other. Consequently, if there are two cycles in the typical *Edwardsia*, there would seem to be no essential difference between the two genera in the arrangement of the tentacles. I shall discuss the details for *E. sipunculoides* below (pp. 379-383).

For a time I deemed the distribution of the capsules of nematocysts to be of generic value, since in *E. sipunculoides* these capsules are scattered irregularly over the column, while in the typical *Edwardsias*

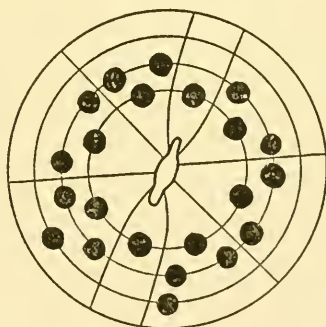


FIG. 7. *Edwardsiella* type (Carlgren).

¹ Arch. Zool. Exp. (3), III, fig. 7, p. 113.

they are usually arranged in eight longitudinal rows in relation to eight series of tubercles. This possibility is destroyed, however, by *E. intermedia* McM., which is described as possessing not more than sixteen tentacles and scattering capsules and tubercles. In *E. sipunculoides* no tubercles were seen.

Finally, the rudimentary mesenteries do not offer the solution I had hoped they might. It is true that *E. beauteupsi* and the San Pedro *Edwardsia* are constructed on the same plan, *i. e.*, according to Carlgren's *Edwardsia* type with the modification already suggested. *E. adenensis*, however, departs from this type and approaches the condition found in *E. sipunculoides*, since it has two rudimentary mesenteries instead of one in each lateral and dorso-lateral primary enterocœl. If these rudimentary mesenteries are conceived as foreshadowing future tentacles, the gap between the species with sixteen tentacles and those with more than sixteen is materially narrowed. At any rate, the species with sixteen tentacles have no consistent mesenterial formula.

For these reasons I have felt justified in reuniting *Edwardsiella* with *Edwardsia*, redefining the latter in the light of recent facts.

EDWARDSIA SIPUNCULOIDES Stimpson.

(Pl. XXIV, figs. 1-3; text-figs. 8-15.)

Actinia sipunculoides STIMPSON, 1853.

Edwardsia sipunculoides VERRILL, 1862.

Edwardsiella sipunculoides ANDRES, 1884.

Localities.—Dutch Harbor, Unalaska; Eastport, Me.; Grand Manan Island, New Brunswick; Henley Harbor, Labrador.

This species was originally described by Stimpson, in 1853, who found a single individual at Grand Manan, N. B. He placed it provisionally in the genus *Actinia*, not caring to dissect his only specimen, and thus remained ignorant of its internal anatomy. It was again described, in 1862, by Verrill, who gave a full external description from life with two figures which were copied by Andres in 1884. I venture to quote Verrill's account entire, supplementing it later with a discussion of the internal anatomy, which he entirely neglected:

"Column very slender, elongated, cylindrical, the central portion traversed by eight longitudinal sulcations, between which it is somewhat swollen in the form of broad, rounded, slightly prominent ribs, crossed in contraction by numerous strong transverse wrinkles. The inferior naked portion when expanded is about one half an inch in length, pointed at the extremity, without any distinct basal disk, but capable of adhering to stones by its membranous surface. This region is marked with eight white lines, which meet at the cen-

tral point of the base and are continuous with the eight sulcations of the column. These coincide with the corresponding internal partitions which are seen through the transparent walls. The upper naked portion, in expansion, is one third of an inch or more in length, smooth and cylindrical. The tentacles are about thirty-six in number, arranged somewhat crowdedly in two rows close to the margin. They are long, slender, tapering to a point, the outer ones a little longer than the inner, which are twice longer than the diameter of the disk; mouth with four small but prominent lobes on each side.

"The color of the central sheathed portion is usually yellowish-brown, but varies to black, according to situation and color of mud where found; basal naked area pellucid yellowish-white; upper naked portion yellowish, surrounded, about midway between the tentacles and sheath, by a ring consisting of eight lunate, arrow-shaped or square opaque white spots, which are close together and sometimes extend downward at the lower angles, forming a white line along the sides of each invagination; tentacles transparent yellowish-white, sprinkled with numerous flake-white dots, sometimes with small, white spots at the outer base. Mouth and stomach bright red, the former generally prominent; disk yellowish, with faint white radii, and white spots often surrounding the bases of the tentacles.

"Length of the largest specimen when in full expansion, about 5 inches; in diameter, .15; when contracted, about 1.5 inches in length."

While this description does not include internal characters so important in Actinian diagnosis, I do not feel justified in separating the Alaskan form from *E. sipunculoides*. Though widely separated from each other geographically, both occur in the same regions as the circumboreal *U. crassicornis* and *M. dianthus*, and both are subjected to the same climatic and physical conditions of life.

In the life-size photographs made from preserved material (Plate xxiv) the "inferior" and "upper naked portions" are obviously much contracted. The adhesiveness of the foot is apparent. In one specimen the œsophagus is completely everted, and the biserial arrangement of the tentacles indicated. I shall return to this latter point when the mesenteries are considered. The number of the tentacles varies with the size, ranging in seven individuals from 20 in the smallest, through 22, 23, 26, 28, 29 to 35 in the largest.

Verrill has not mentioned the capsules of nematocysts embedded in the body wall and opening outward by a narrow orifice. They are

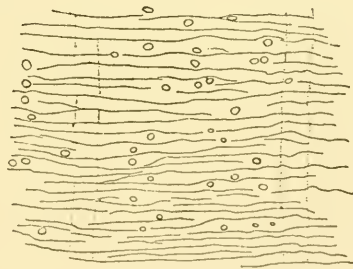


FIG. 8. *Edwardsiella sipunculoides*. Portion of body wall, showing capsules of nematocysts.

found scattered throughout the column in large numbers, but not in definite rows as in the typical *Edwardsia*. Fig. 8 was drawn from a portion of the wall removed from the polyp shown in Plate xxiv, fig. 3. The transverse lines are surface wrinkles. The two pairs

of dotted lines indicate the contours of the bases of two adjacent mesenteries. Only the outlines of the capsules appear.

Structure.—The three regions of the body wall differ in histological structure. The capitulum (fig. 9) possesses no cuticle; the ectoderm contains numerous gland cells with granular contents, and occasional goblet cells; it is much thicker than the endoderm; the mesogloea is comparatively thin. In the scapus the relative thickness of ectoderm and endoderm are reversed. Fig. 10 represents a longitudinal section of

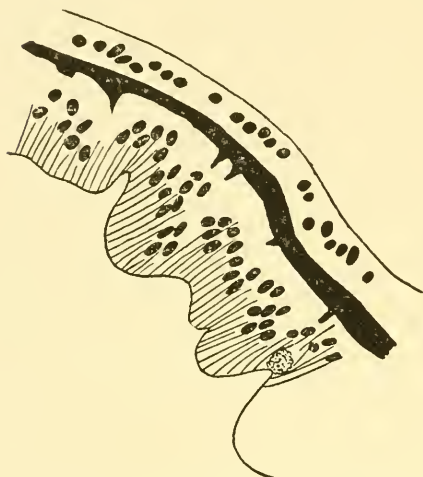


FIG. 9. *Edwardsiella sipunculoides*. Section through capitulum.

this region. The columnar cells of the ectoderm are much lower than those of the endoderm. They are covered by a cuticle in which several lamellæ can be distinguished and to which sand grains, diatom shells and other débris adhere. The mesogloea is thick and is thrown into a great number of transverse folds on the side turned toward the endoderm. These folds are covered by a continuous layer of circular muscle fibers. The endoderm is twice the thickness of the ectoderm. In the physa the ectoderm is crowded with gland cells, which account for its adhesiveness. A cuticle is absent. Everywhere in the endoderm—in the tentacles, mesenteries, mesenterial filaments, and parietal endoderm—there are large gland cells with deeply staining granules.

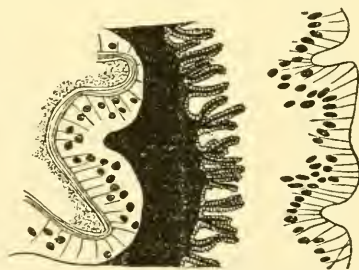


FIG. 10. *Edwardsiella sipunculoides*. Longitudinal section through scapus.

There is no special sphincter muscle.

The tentacles possess a thick ectoderm which is crowded with nematocysts and granular gland cells; goblet cells also occur. Near the base of the ectoderm is a layer of nervous fibrillar substance. Between this and the inconspicuous mesogloea are the longitudinal muscles. The endoderm bears about the same relation to the ectoderm as it does in the capitulum.

The œsophagus is readily eversible. The specimen represented in Plate xxiv, fig. 1, showed no trace of a siphonoglyph. In sections of two others only *one* siphonoglyph was found in each, placed ventrally. The wall of the œsophagus is wrinkled longitudinally, though there are no such folds as are characteristic of the œsophagus of *Charisea*.

The mesenteries may be divided into two groups. The first comprises the eight primary mesenteries. These exhibit no special peculiarities (fig. 11). Each bears a much convoluted mesenterial filament with a median glandular and two lateral ciliated lobes above, and one only, the median, below; also a gonad in its oral half. The basal muscle is so folded as to be fan-shaped in cross section. The main longitudinal muscle band is very strong, and is placed nearer the free edge than the base of the mesentery. It is adnate to the mesentery for its inner half only, the outer half being free.

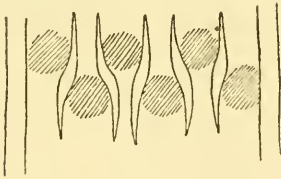


FIG. 12. *Edwardsiella sipunculoides*. Rudimentary mesenteries between the bases of two primaries. Openings of tentacles shaded.

that adjoining mesenteries are nearer to each other at one end than at the other (fig. 12). This condition is correlated with the arrangement of the tentacles, which open between the mesenteries in a strictly alternate fashion (fig. 13). A cross section through this

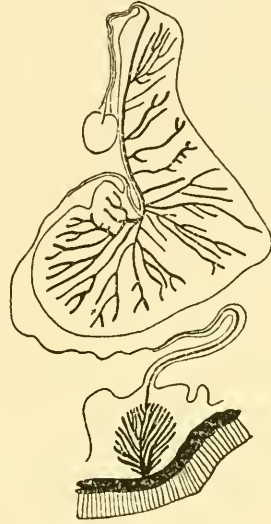


FIG. 11. *Edwardsiella sipunculoides*. Cross section of mesentery.

region (fig. 14) according to the line $x-x$ (Fig. 14) shows that although the mesenteries are minute, they are furnished with a central

band of mesogloea, upon which is spread a thin and rather inconspicuous, yet unmistakable layer of longitudinal muscles.

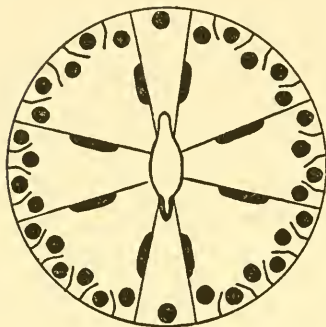


FIG. 13. *Edwardsiella sipunculoides*. Diagram of arrangement of mesenteries and tentacles (indicated by black spots).

The arrangement of the rudimentary mesenteries and their accurate correlation with the tentacles, shown in fig. 12, is not the invariable rule. Another individual with thirty-two mesenteries had but twenty-five tentacles. The mesenteries were distributed according to the formula: I, 3, II, 5, III, 5, IV, V, 4, VI, 5, VII, 2, VIII, in which the roman numerals represent the primaries and the arabic the number of rudimentaries between every two primaries.

Not only are the rudimentaries not distributed according to the numerical plan in fig. 13, but they are not even bilaterally arranged.

If we examine the three mesenterial types which have been described for *E. beautempesi*, *E. adenensis* and *E. sipunculoides* respectively, it is at once evident that the plan exemplified in *E. beautempesi* is the only one that fulfils the requirements of an ancestral form. We may conceive the transformation from the octamerous to the hexamerous condition to have been accomplished by the growth of the mesenteries in the lateral and ventro-lateral spaces, the mesenteries in the dorso-lateral spaces forming the first two pairs of the second cycle.

The rudimentary mesenteries in *E. adenensis* arise apparently in pairs which in arrangement suggest the second cycle in *Halcompa*.

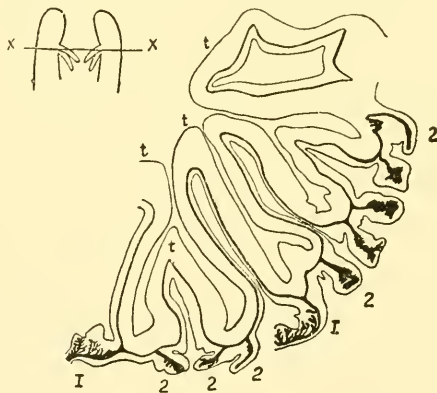


FIG. 14. *Edwardsiella sipunculoides*. Cross section through region of rudimentary mesenteries, at level $x-x$ in small figure.

If, however, they may be homologized with the latter, there can be no representatives in *E. adenensis* for the four primary mesenteries by which the transformation of the octamerous into the hexamerous type is effected. On the other hand, if four of the eight mesenteries in the lateral and ventro-lateral spaces do represent the fundamentals of these perfect mesenteries, then the rudimentary mesenteries in these spaces do not arise in pairs, and we cannot account for the hexamerous type any more successfully on this ground.

E. sipunculoides is a still more aberrant form. The rudimentary mesenteries do not occur in pairs, and are too variable to constitute a stable foundation for a phylogenetic scheme.

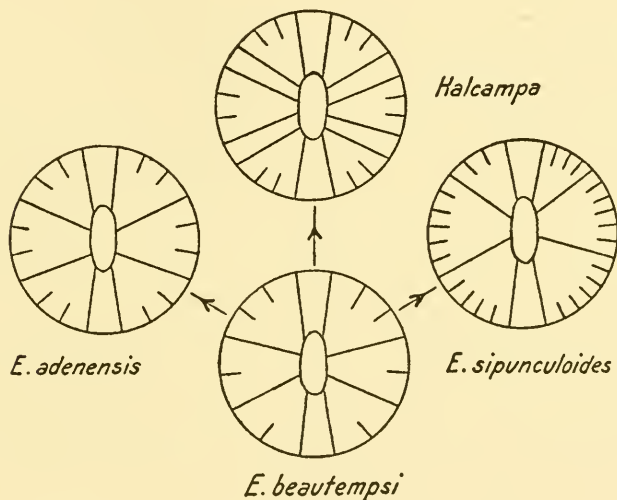


FIG. 15. Scheme of the possible relationship of the species of *Edwardsia* and the Hexactiniæ (through *Halcapa*).

These ideas of the relationships of the species of *Edwardsia* and the Hexactiniæ may be graphically expressed in the above diagram (fig. 15).

Order ACTINIINÆ M. Edw.

“Hexactiniæ in which the tentacles are arranged in cycles, only a single tentacle communicating with each endocœl.” (McMurrich, 1893, p. 141.)

Family HALCAMPIDÆ.

“Actiniinæ with a small number of mesenteries, six, ten or twelve pairs being all that are present; longitudinal muscle pennons narrow but strong; no special sphincter muscle; conchula present or absent; base usually rounded and vesicular.” (McMurrich, 1893, p. 141.)

Genus Harenactis gen. nov.

Length great in proportion to the diameter of the column; tentacles twenty-four in number, in one series; conchula absent; cinclides in twenty-four regular longitudinal rows; base vesicular. Mesenteries arranged hexamerously, in twelve pairs, all perfect above, two pairs being directives, though there is but one siphonoglyph; no acontia.

HARENACTIS ATTENUATA sp. nov.

(Pl. xxiv, figs. 4, 5; text-figs. 16, 17.)

Locality.—San Pedro, Cal.

This animal is found in the harbor of San Pedro, Cal., buried perpendicular to the surface in the fine sand of flats exposed at low tide. Usually the tentacles rest upon the sand in full expansion, but occasionally as much as half an inch of the column is exposed also. When unduly stimulated it may withdraw several inches into its burrow by shortening the body to less than half its length.

The length of the column is remarkable in comparison with its diameter. These dimensions at their maximum are approximately sixteen inches and three quarters of an inch respectively. From its widest point, in its oral third, the column tapers gradually to the base where it abruptly expands. Just above this expansion it is extremely narrow and weak, for which reason great care must be exercised to obtain a perfect individual from the sand in which it lies buried.

The base assumes various shapes, though never exceeding the column in diameter. At times it becomes an almost spherical vesicle with very thin walls traversed by lines which mark the basis of the mesenteries within (Pl. xxiv, fig. 5); at others it may flatten into a thin disk, in which condition I have found it adhering to a bit of shell.

From the edge of the oral disk twenty-four tentacles arise. They are in one series, although, as shown in Pl. xxiv, fig. 4, twelve curve upward and inward, alternating with the other twelve which appear to bend downward rather than upward. Each is not more than three quarters of an inch in length, stout, with a bluntly pointed imperforate tip. Within the bases of the tentacles the oral disk is oval

in shape. In its greater diameter lies the elongate mouth, with prominent lips, and a single siphonoglyph.

The oral disk and tentacles are smooth. The column, though exhibiting in contraction numerous strong transverse wrinkles and slight incidental roughenings, is smooth in expansion, with twenty-four shallow longitudinal furrows indicating the bases of the mesenteries (Pl. xxiv, fig. 4). Between every two adjoining mesenteries in the upper portion of the column is a row of cinclides. These are quite regularly spaced, one in every row lying approximately in the cross section of the column. As there are twenty-four rows in all, the cinclides of one row open into exocœls, those of the next into endocœls.

The color of the column is a dirty white. The tentacles are pale green, marked with three or four grayish-white bands and a longitudinal row of fine white milky dots on each side.

Structure.—The ectoderm of the body wall is composed of high columnar epithelium, in which nematocysts and gland cells with granular contents are abundant, and goblet cells not uncommon. The mesogloea is thick, with conspicuous lamellæ. The parietal endoderm is low, with few gland cells.

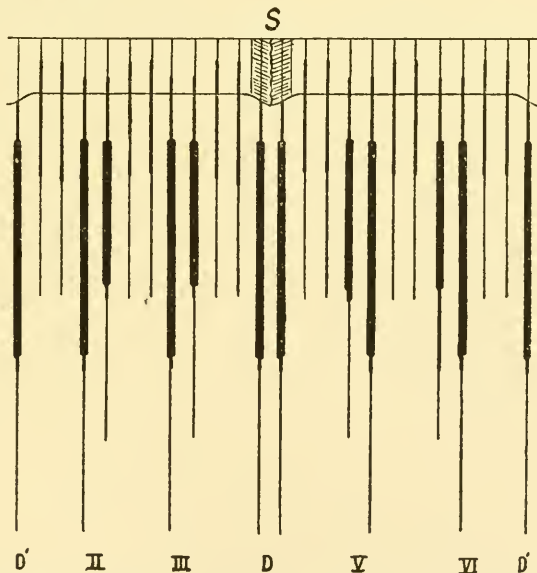


FIG. 16. *Harenactis attenuata*. Diagram showing symmetrical arrangement of mesenteries and their structure with respect to the siphonoglyph.

The oral disk is furnished with ectodermic muscles which are continuous with the longitudinal muscles of the tentacles. The tentacles

have a thick ectoderm with the customary masses of nematocysts and layer of deeply lying nervous tissue. The mesoglœa is thick. The endoderm is lower, with few gland cells and a layer of circular muscle fibers.

There is no special sphincter muscle. The endodermal circular muscles are strongly developed throughout the column. The ectoderm of the œsophagus contains numerous deeply staining gland cells with distinctly granular contents, thus differing from the homogeneous cells in a similar position in *Charisea*. There is but one siphonoglyph, placed in a position corresponding to one end of the mouth.

There are twelve pairs of mesenteries, each with a parietal ostium. They may best be discussed in connection with the accompanying diagram (fig. 16). The latter represents the body wall and œsophagus as having been sectioned longitudinally on one side between one pair of directives, and then stretched out flat so that the relations of the mesenteries might be more readily seen. The narrow horizontal lines at the top of the figure indicate the limits of the œsophagus, which is

represented as transparent, though not actually so. The narrow vertical lines represent the mesenteries, the length of these lines suggesting, not the length of the mesenteries, all of which are continued to the extremity of the body, but their relative importance in width and in size of retractors. The heavy lines on all of the mesenteries represent the mesenterial filaments, each a single strand of epithelium crowded with gland cells and resting on a cushion of epithelium. There are no acontia. The broad black bands represent gonads (fig. 17.)

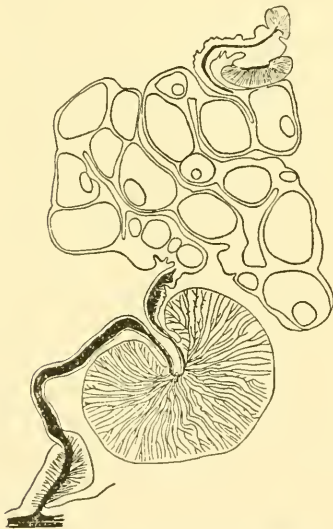


FIG. 17. *Harenactis attenuata*. Cross section of primary mesentery through mesenterial filament, gonad and longitudinal muscle.

It is evident at once that the mesenteries are arranged on a hexamerous plan in two alternating cycles which differ in several respects. The mesenteries of the second cycle are smaller than those of the first, their retractor muscles are not so strong, and they may only occasionally bear gonads. The filaments on all the mesenteries begin at the

free edge of the œsophagus. Those on the second cycle follow the borders of their mesenteries farther dorsalward than those on the first cycle, in which the mesenteries are wider. The upper ends of the thick lines in the diagram should be taken as the summits of these archings of the filaments and not as their points of attachment to the œsophagus.

There are several points of interest connected with the mesenteries of the first cycle. First, there are *two pairs of directives* although there is but *one siphonoglyph*. These directives are associated with two slight downward prolongations of the œsophagus, and their mesenterial filaments do not arch orally, but proceed immediately downward along the edges of their mesenteries. The directives thus appear to be the widest and most important of all the mesenteries. This importance is not associated with any structural peculiarity of the mesenterial filaments, so far as I could see.

Further, the directives are the only pairs of the first cycle whose members are equivalent in width, strength of retractors, length of mesenterial filaments and size of gonads. The other pairs are arranged bilaterally on each side of them. The member of each pair with the smaller gonad, shorter mesenterial filament, etc., is nearer the pair of directives which is associated with the siphonoglyph. Since there are two pairs of directives, this bilaterality is clearly correlated with the single siphonoglyph. Such a conclusion is interesting in connection with the tendency of the non-directives in the monoglyphic individuals of *Metridium* to mass themselves on the side of the œsophagus opposite the siphonoglyph and a pair of directives. There it is impossible to tell whether the behavior of the mesenteries is correlated with the siphonoglyph or the directives. The condition in *Harenactis* eliminates this difficulty and makes it probable that the siphonoglyph is of more importance than the directives in determining mesenterial arrangement. While we are ignorant of the real nature of the correlation, it is probable that this is to be sought first among the causes of the variation in the number of siphonoglyphs, regardless of the directives.

Family ACTINIIDÆ Gosse.

Actiniidæ adhering to foreign bodies by a flat contractile base. Column usually smooth, occasionally verrucose towards the upper part, without cinclides. Margin frequently provided with acrorhagi, but may be smooth. Tentacles numerous, usually long. Sphincter muscle endodermal, diffuse, usually feebly developed. Perfect mesenteries usually numerous, and all may be fertile, but sometimes the first cycle, and more generally the directives are sterile. No acontia.

Genus *Charisea* gen. nov.

Body wall smooth. No parapet, nor acrorhagi. Mesenteries in three cycles; the six pairs of primaries alone perfect. Gonads on primary pairs only. Tentacles moderate. Strong endodermal circular muscle layer, with no distinct sphincter.

Among the genera of Actiniidæ, *Charisea* is most nearly related to *Macrodactyla* and *Condylactis*. It differs from the former in having no suckers on the column, and in the restriction of the gonads to the six primary pairs of mesenteries. The absence of a parapet and its regular mesenterial formula distinguish it from *Condylactis*.

CHARISEA SAXICOLA sp. nov.

[(Pl. xxiv, figs. 6-9; text-figs. 18, 19.)]

Locality.—Sitka.

This actinian was found in considerable numbers on the shore rocks at Sitka. An idea of its general form is given on Plate xxiv. In contraction, the column varies from three quarters to one and one half inches in length, and from three sixteenths to half an inch in diameter. The foot disk may be as broad as the column. When preserved, it contracts much and is largely concealed by the dilation of the thin region of the wall just above it.

The column is smooth, unperforated by cinclides, and without parapet or acrorhagi. The tentacles are of moderate length, subequal, slender and pointed. There may be 44, 46, 48, or 50 of them, in three cycles, corresponding approximately with the mesenteries within. They may be drawn completely into the body, the wall contracting over them in a characteristic manner (fig. 8).

The color of the column in preserved material is a yellow-brown, lighter near the foot. The tentacles are yellow.

Structure.—The body wall is much thicker above than near the foot. The ectoderm contains numerous gland cells and nematocysts. The mesogloea is lamellated. The endodermal cells are large vacuolated, with a sprinkling of gland cells and a strongly folded layer of circular muscle fibers.

The œsophagus has two siphonoglyphs, between which it is strongly folded. The ridges of the folds are packed with gland cells full of granules. Nematocysts are plentiful. There is a third type of cell, probably glandular, which is abundant on the whole œsophageal wall. It is oval in shape, has a sharp contour, is much larger than a nematocyst, and takes and gives up stains with equal difficulty. It resembles

the gland cells in the œsophagus of *Harenactis*, but shows no trace of granules; the contents are quite homogeneous.

The tentacles exhibit no special features. They possess ectodermic longitudinal muscles and endodermic circular muscles, neither very strong.

There are twenty-four pairs of mesenteries biradially arranged.

(a) Six pairs, forming the first cycle, are perfect, and bear the gonads and the trilobed mesenterial filaments. Two of these pairs are directives. The muscles of each mesentery are concentrated into a stout retractor and a parieto-basilar (fig. 18). The shape and distance of the latter from the body wall differs according to the levels at which sections are taken. The endoderm of the mesenteries is conspicuously high in comparison with that of *Harenactis*. Gland cells are scattered through it, though quite absent from the parietal endoderm.



FIG. 18. *Charisca saxicola*. Cross-section of primary mesentery, in œsophageal region.



FIG. 19. *Charisca saxicola*. Mesenteries of the second and third cycles between contiguous pairs of primaries.

(b) Eighteen pairs are imperfect, all lacking both gonads and mesenterial filaments. Six pairs belong to the second cycle, and occupy the center of the spaces between adjacent pairs of primaries. At their bases their muscles are distributed equally on both faces, but near the free edge they are localized in folds on the face of each mesentery which is turned toward its mate (fig. 19). The remaining twelve

pairs are tertiaries, placed between the primaries and secondaries. One member of each pair is confined to the region of the tentacles and is not more than two millimeters long. It always lies between a primary mesentery and the other member of the pair. The latter almost equals the secondaries in size, and is plentifully supplied with longitudinal muscles on both faces (fig. 20).

Family CRIBRINIDÆ McMurrich.

Bunodidæ GOSSE, 1860.

Tealidæ R. HERT, 1882.

Bunodactidæ VERRILL, 1899.

Actiniinæ with a flat contractile base; column usually with verrucæ or tubercles; margin often with complicated acrorhagi. Sphincter muscle strong, circumscribed, endodermal; perfect mesenteries usually numerous; acontia absent.

In his latest paper, published in 1901, McMurrich has united with Ehrenberg's genus *Cribrina* the synonymous *Bunodes* Gosse, *Bunodactis* Verrill and *Evactis* Verrill; and has made the necessary modification in the family name to accord with that of the type genus. In accepting these changes I have not thought it necessary to repeat the reasons supporting them, which McMurrich has already discussed at length.

Genus *Cribrina* Ehr.

Cribrinidæ without true acrorhagi; usually with numerous perfect mesenteries which are in some cases in other than a hexamerous plan; sphincter strong; ectodermal musculature of the disk and tentacles not imbedded in the mesoglæa; column wall destitute of an epidermal covering and provided with verrucæ arranged more or less distinctly in vertical rows; tentacles simple (McMurrich, 1901).

CRIBRINA ARTEMISIA.

Localities.—Puget Sound; Sitka; Yakutat; Popof Island; Dutch Harbor. Abundant.

Genus *Urticina*.

This genus is distinguished from *Cribrina* only in the bedding of the muscles of the tentacles and disk in the mesoglæa, according to McMurrich, who suggests that this character may prove to be inadequate ground for separation. The single specimen in the Harriman collection affords no means for settling the question.

URTICINA CRASSICORNIS.

Locality.—Yakutat, one large specimen. Also found on the Atlantic and northern coasts of Europe, Great Britain, Iceland, Spitzbergen, Greenland, Atlantic coast of North America from Cape Cod northward, and Pacific coast of same from Puget Sound northward into Bering Sea.

Genus *Epiactis* Verrill.

Actinia (in part), DANA, 1846.

Leiothealia HERTWIG, 1882.

Cribrinidæ with smooth column wall, without tubercles or verrucæ; tentacles of equal size, arranged in several cycles.

More than thirty years ago Verrill described an anemone from Puget Sound under the name of *Epiactis prolifera*, which was characterized by the habit of bearing a circle of young in various stages of development on its column wall just above the foot. The real affinities of the species remained unknown, through lack of an anatomical description, until 1899, when it was shown to be a member of the Cribinidæ (Bunodidæ), but differing from the typical species of this family in being destitute of verrucæ or suckers on the column.

Meanwhile, Hertwig had found another smooth-bodied representative of this family in the Challenger material, which he identified as Drayton's *Actinia nymphaea*, and for which he erected the genus *Leiothealia*, with the following definition:

“Tealidæ with smooth body surface, without warts, and without spherules, but with longitudinal furrows corresponding to the insertions of the septa, tentacles of equal size arranged in several rows.”

I agree with McMurrich, that the longitudinal furrows are not important characters. Nor do I think, after comparing *E. prolifera* and the Alaskan species, *E. ritteri*, with Hertwig's *Leiothealia*, that the pinnate arrangement of the sphincter muscle fibers is of generic value. In the first place, while the sphincter of *E. ritteri* (fig. 21) approaches the pinnate type of *L. nymphaea*, it yet exhibits features of a nature transitional to the condition in *E. prolifera*. In the second place, *E. ritteri* is related in all other characters more closely to *E. prolifera* than to *L. nymphaea*. The presence in the column of the special diffused sphincter muscle which Hertwig has described does not appear to me to warrant the importance that Haddon attributes to it in his definition of *Leiothealia* since such a sphincter may be derived from the strong circular muscles of *Epiactis* by very slightly modifying the latter.

For these reasons I have united *Leiotecalia* with *Epiactis*, the latter name having priority.

EPIACTIS PROLIFERA Verrill.

(Pl. xxv, figs. 4, 5; text fig. 20.)

Localities.—Puget Sound; Tomales Bay; San Francisco; Pacific Grove; San Pedro, Cal. Not uncommon.

In his recent diagnosis of this species Verrill describes the sphincter as "large, clearly circumscribed, ovate in section, essentially endodermal, but not so much detached from the wall as usual in *Bunodactidæ*."

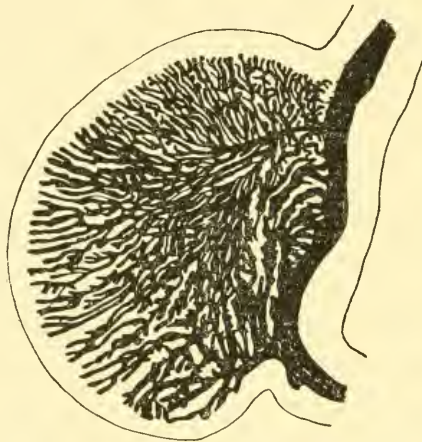


FIG. 20. *Epiactis prolifera*. Cross section of sphincter muscle. Mesogloea black.

To remove all doubt as to its endodermal nature, I have reproduced the sphincter of a specimen from Pacific Grove, Cal., in the accompanying figure (fig. 20) which Professor Verrill writes me agrees perfectly with his observations.

Epiactis prolifera is much smaller than *E. ritteri*. It exhibits, though to a less degree, the wrinkling of the column near the foot so characteristic of that species.¹ There may be but one siphonoglyph, though two is probably the typical number. Six pairs of mesenteries, including the directives are perfect throughout the length of the œsophagus. Six others belonging to the second cycle, may reach the œsophagus near the mouth only. All are arranged with marked symmetry about the major mouth axis.

¹ Individuals taken recently in San Pedro (July, 1902) were almost twice the diameter of specimens figured on Plate xxiv. No wrinkles were observed on live animals, and are probably due to contractions produced by the killing process.

Up to the present time *E. prolifera* had been recorded from Puget Sound alone. Collections from Tomales Bay, San Francisco, Pacific Grove, and San Pedro, Cal., enable me to extend its range southward for several hundred miles.

*EPIACTIS RITTERI*¹ sp. nov.

(Pl. xxv; figs. 6, 7; text-fig. 21.)

Locality.—Popof Island.

There are several specimens of this actinian in the collection, from the shores of Popof Island, Alaska.

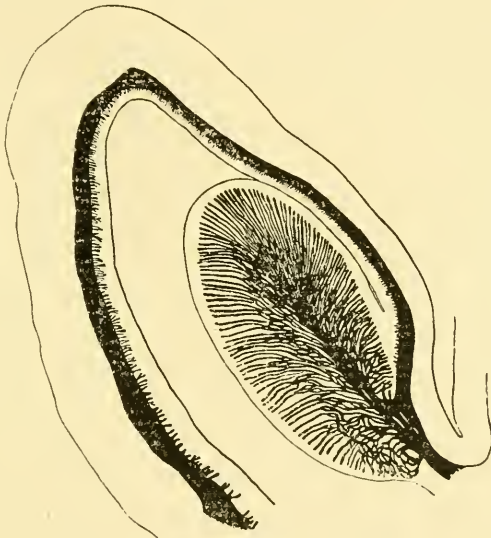


FIG. 21. *Epiactis ritteri*. Section through upper portion of the column, across the sphincter and other endodermal muscles. Mesogloea black.

The column is about as broad as long, with a well-expanded foot disk. The life-size photographs reproduced in Plate xxv, figs. 6 and 7, give a fair idea of the shape of the animal in partial and complete contraction. The body wall is smooth, without true verrucæ, though near the foot there may be ten or twelve rows of protuberances which slightly resemble them. These are caused by transverse and longitudinal wrinkles, and are of the same histological character as the rest of the wall. They vary greatly in size, even in the same individual. There are no cinclides. The tentacles are numerous, moderate, subequal, in several rows, and may be entirely concealed in contraction.

¹ Named for Professor Wm. E. Ritter, of the University of California, who made the collection, and to whose kindness I owe the opportunity of examining it.

The color of the column is dark red-brown; the tentacles are much lighter.

Structure.—The body wall is thick, with a high columnar epithelium which contains numerous gland cells, to whose pigmented contents the color of the column is largely due. Nettle cells are also present, but goblet cells are wanting. There is no suggestion of a mucous covering. The mesoglœa is thick—a sort of fibrous felt work with scattered nuclei. The endoderm possesses a layer of circular fibers, strongly folded. Here and there a few fibers have been incorporated into the mesoglœa. The sphincter is strong, endodermal, subpinate, circumscribed, with a moderate base (fig. 21).

The longitudinal muscles of the tentacles are ectodermal. The œsophagus has many folds. The ectoderm is thick, filled with gland cells and nematocysts. There may be one or two siphonoglyphs.

The mesenteries are arranged in five cycles. There are one or two pairs of directives, according to the number of siphonoglyphs. Twelve pairs are usually perfect above, those of the first cycle reaching farther down on the œsophagus than those of the second. The diglyphic forms may be regular or irregular; for instance, the mesenterial formula in one specimen was D, 2, 3, 4, D, 6, 7, 8, 9, 10, 11, 12. One monoglyphic individual had thirteen pairs of perfect mesenteries. Both perfect and imperfect mesenteries are furnished with mesenterial filaments, and all save those of the fifth cycle bear gonads. Acontia are wanting. The parieto-basilar muscles are strong, each in the form of a lobe similar to those in *L. nymphæa*. The retractors are flat, differing markedly from the extraordinary retractors figured by Hertwig.

E. ritteri may be distinguished from *E. prolifera* by its larger size, the shape of the sphincter, and the absence of the habit of carrying the young externally.

Family SAGARTIIDÆ Gosse.

Actiniinæ with adherent pedal disk; with a mesoglœal, rarely a weak endodermal, sphincter; with acontia, which are either emitted through the mouth alone or also through special openings (cinclides) in the column wall. (McMurrich, 1901, *δ*.)

Subfamily METRIDIIDÆ Carlgren.

Segartiidæ with six or more pairs of perfect mesenteries; body wall relatively thin, and without a cuticle: cinclides present; usually well-developed mesoglœal muscle.

Genus **Metridium** Oken.

"Metridiinae with a smooth body wall and numerous tentacles which extend over nearly the whole of the oral disk, which is greatly expanded and frilled; the upper border of the column is swollen to form a thickened ring, above which is the delicate capitulum." (Haddon, 1898.)

METRIDIUM DIANTHUS Ellis.

Localities.—Kodiak, Yakutat and Sitka, in great abundance. Also coasts of Europe, east coast of North America from the Arctic to Cape Hatteras and west coast of same from Alaska to San Francisco.

McMurrich described *M. dianthus* in great detail in 1901, and gave cogent reasons for uniting *M. marginatum* and *M. fimbriatum* with Ellis' species. I shall therefore limit myself to an examination of the variations in *Metridium*.

VARIATION IN **METRIDIUM**.

As is well known, *M. dianthus* possesses three conspicuous color types: brown, salmon or orange, and white. According to a suggestion by McMurrich, the brown may be the fundamental type, from which the others are derived by direct transformation. In support of this view he states, firstly, that the smallest individuals of his material are brown; secondly, that white and salmon polyps may exhibit blotches of brown, as though in process of changing their color, although white polyps never appear to be blotched with salmon, and vice versa.

Embryological evidence which would be conclusive on this point, is as yet wholly wanting. My own observations on great numbers of *Metridium* in Oakland Harbor, Calif., indicate that this change of color is not a widespread phenomenon. I have found white and salmon polyps of exceedingly small size quite commonly. Whether these have come from the egg or from fragments of the pedal disk is a question which applies with equal force to the brown type. That *all* the very small polyps one finds do not arise from this fragmentation seems to be a necessary assumption concerning an animal which reproduces sexually as well. Recent observations made for me by my friend John M. Willard, of Oakland, Calif., show no difference in the relative proportions of the color types among the very smallest and among the average individuals. This fact is significant. The proportions were: salmon, 50 percent, white, 45 percent; brown, 5 percent. Special pains were taken to avoid errors referable to basal

fragmentation, by making haphazard observations in various localities upon thousands of polyps. Even though the percentages obtained are only approximate, they give little support to the view that the brown is the fundamental type.

Nor is the evidence gathered in a special search for polyps showing color transitions any more favorable. Only five such cases were found. One was a muddy lavender blotched with orange, another was a faded salmon spotted with brown, and three were dark brown striped with orange. While these may have been changing their color, it is not evident that all were originally brown, nor is it any more probable that such an inconspicuous process could have any marked effect upon the species as a whole. All were found within a few feet of each other under a float in Oakland Harbor, where the water was dirty and polluted with sewage. In the same place there were small percentages of muddy lavender and pale orange polyps. These were quite absent under a railroad mole some miles away, where the water was much cleaner and better aerated, while the three main color types flourished. For these reasons I am disposed to believe that conditions of life effect certain minor transformations in the color of *Metridium*, though it does not seem to me that the three conspicuous types are resultants of such a process.

I have said that errors might be introduced into a study of variation of *Metridium* by disregarding its power of multiplication by basal fragmentation. This method of reproduction is not uncommon among anemones, particularly Sagartids. It was noted more than a century ago by Abbe Dicquemare in the course of his observations on *M. dianthus*, and has been noted many times since. Andres, in 1881, gave a complete description of it, for two species of *Aiptasia* and one *Bunodes*. It is the main cause, I feel sure, of the patches of polyps of the same color which are noticeable wherever *Metridium* is abundant. These first attracted my attention in Oakland Harbor, where the phenomenon was exceedingly striking. There the anemones were wont to attach themselves to the piles supporting the wharves and bridges. It was not an unusual sight to see one pile covered completely for several feet of its length with white polyps only, while the adjacent pile might be as exclusively devoted to brown or orange. Parker, in 1899, accounted for a similar state of affairs at Salem, Mass., on this basis. The same explanation applies to the case cited by Gosse, in 1860, and mentioned by McMurrich, in 1901, of the board, on one side of which all the polyps were white, on the other, orange. Any one may obtain strong evidence that this is the real explanation by

keeping specimens of *Metridium* under observation for a few weeks. In a few days most of them will show signs of laceration at the edge of the pedal disk, and some surrounded by groups of young. Occasionally the entire edge may be torn away at once, later breaking up into several pieces each of which usually gives rise to at least one individual.

Basal fragmentation is especially interesting as a factor in the variation of the mesenteries and siphonoglyphs, so remarkable in *M. dianthus*. Parker, in 1897, discussed the variation of these structures in a very interesting paper, and suggested that the variation in the number of siphonoglyphs might be correlated with the methods of reproduction. He appears to have thought that all monoglyphic individuals possibly arose as small buds which were cut off from the margin of the animal between its aboral disk and column; while all diglyphic polyps may have been sexually produced. In a later paper he slightly modified this suggestion by correlating mesenterial variation also with method of reproduction, expressing the opinion that regular hexamerous diglyphic specimens are possibly the result of sexual reproduction only. Whether monoglyphic or irregular diglyphic individuals are, in his opinion, ever produced sexually he does not say.

The great numerical importance of basal fragmentation among the modes of reproduction in *Metridium* and the irregularity of the mesenteries in the fragments which grow into new polyps, render a statistical method of inquiry into the suggested correlation of type and reproductive process necessarily inadequate. The problem will approach complete solution only when we have overcome the difficulties in the way of raising polyps from the egg. However, I have decided to set forth the results of my observations on the variability of *Metridium*, because they not only differ from those of Parker and McMurrich in some details but offer grounds for believing that the variation in *Metridium* is not necessarily correlated with the method of reproduction.

It will be well to consider first the methods of reproduction in *Metridium*, and the relative importance of each in producing variations.

Besides the sexual method *Metridium* reproduces non-sexually by means of (a) fission, (b) budding, and (c) basal fragmentation, already considered.

Fission is longitudinal, either equal or unequal, more often the latter. Usually the plane of division passes through one siphonoglyph, though

in diglyphic polyps, in exceptional cases, both or neither may be involved. In such cases the plane of division may be perpendicular to or parallel with the major axis of the mouth.

Budding takes place either (*a*) in the œsophageal region, where the œsophagus of the bud may or may not be independent of that of the parent, and the buds may vary greatly in size; or (*b*) in the vicinity of the foot disk, where the buds are relatively very small.

It has been shown by Parker that fission of the typical sort may be complete; so that the partially separated individuals commonly found are not monsters, but represent stages in the process. The progress of division, however, is extremely slow, requiring many months at least for its completion. Whether œsophageal buds ever become free is not known, so far as I am aware, although buds from near the foot disk may detach themselves in a few weeks.

That neither fission nor budding has more than a trifling influence on the number of individuals will be apparent from the following figures. Among 2,662 polyps observed, only 67, or 2.5 percent, were monogenous. Among 46 of these monogenous polyps, 26, or 56 percent, were in process of division, 7 equally and 19 unequally; there were buds in the œsophageal region of 6, or 13 percent, in the pedal region of 10, or 22 percent; 4 were doubtful cases, due either to budding or unequal fission. About 12 percent of the entire number of monogenous polyps, 8 out of 67, were colonies of three or four individuals. These were formed by fission, by budding, or by both combined.

While budding from the œsophageal region and fission progress very slowly and among a very small number of polyps, basal fragmentation produces new individuals very rapidly and is of universal occurrence. Almost all non-sexually produced polyps therefore arise by the latter process, basal fragmentation. And so, with the possible exception of budding near the foot disk, which in certain respects resembles basal fragmentation, we may disregard both fission and budding, since they play an insignificant part in producing variations in *Metridium*.

In a paper on Monogenesis in *Metridium* published in the Proceedings of the California Academy of Sciences in 1898 I have given (fig. 7, upper left-hand individual in this group of three) the drawing of a diglyphic, hexamerous and approximately regular polyp. *Yet this polyp is a product of the non-sexual reproductive process of fission.* This is an isolated case, but I hope soon to show that it is not an exceptional one.

In order that the subsequent discussion may be intelligible, the accompanying tables are introduced.

TABLE I. MONOGLYPHIC AND DIGLYPHIC TYPES OF POLYPS.

| Locality. | Total Number. | Monoglyphic. | | Diglyphic. | |
|------------------------------|---------------|--------------|----------|------------|----------|
| | | No. | Percent. | No. | Percent. |
| Oakland, Cal. | 200 | 157 | 78.5 | 43 | 21.5 |
| Newport, R. I., (Parker). | 131 | 77 | 59 | 53 | 41 |

The polyps from Oakland in Table I were gathered with the utmost precaution against statistical errors; so that I am at a loss to account for the discrepancy between Parker's figures and my own, save on the ground of different environments.¹

TABLE II. MONOGLYPHIC TYPE OF POLYPS.

| Pairs, Non-directives. | Localities. | | | | Pairs, Non-directives. | Localities. | | | |
|---------------------------|-------------|--------|-------|----|---------------------------|-------------|--------|-------|----|
| | Oakland. | Salem. | Newp. | | | Oakland. | Salem. | Newp. | |
| 2 | 2 | 2 | 1 | | 7 $\frac{1}{2}$ | 11 | | 1 | |
| 2 $\frac{1}{2}$ | 2 | | | | 7 $\frac{1}{2}$ | | | 1 | |
| 3 | 11 | 13 | 4 | 1 | 8 | 14 | 26 | 11 | 5 |
| 3 $\frac{1}{2}$ | 6 | | 1 | | 8 $\frac{1}{2}$ | 6 | | 1 | |
| 3 $\frac{2}{2}$ | 1 | | | | 8 $\frac{2}{2}$ | 1 | | | |
| 4 | 27 | 33 | 7 | 4 | 9 | 6 | 12 | 5 | 1 |
| 4 $\frac{1}{2}$ | 10 | | 1 | | 9 $\frac{1}{2}$ | 2 | | | |
| 4 $\frac{2}{2}$ | 2 | | | | 9 $\frac{2}{2}$ | 2 | | | |
| 4 $\frac{3}{2}$ | 2 | | | | 10 | 2 | 5 | 6 | 4 |
| 5 | 53 | 64 | 31 | 20 | 11 | 1 | 3 | 1 | |
| 5 $\frac{1}{2}$ | 16 | | 5 | | 11 $\frac{1}{2}$ | 1 | | 1 | 1 |
| 5 $\frac{2}{2}$ | 4 | | | | 12 | 1 | 2 | | |
| 6 | 37 | 55 | 32 | 19 | 13 | 1 | 1 | | |
| 6 $\frac{1}{2}$ | 13 | | | | 14 | 0 | | | 1 |
| 6 $\frac{2}{2}$ | 1 | | | | | | | | |
| 7 | 19 | 38 | 23 | 21 | Total. | 254 | | 132 | 77 |

The correspondences in Table II are closer. This table is arranged to show the variation in number of mesenteries among monoglyphic individuals from three localities. The fractions in the column for non-directives indicate the perfect mesenteries which have no mates. Thus, $\frac{2}{2}$ indicates two unpaired perfect mesenteries (or half-pairs). The number of polyps possessing such mesenteries is remarkably large in the Oakland material. Parker did not note them in his tabulation of Newport specimens, though he remarked their occurrence.

¹ Carlgren (1893, p. 104) says that usually there is but one siphonoglyph in *M. dianthus*. The same fact was pointed out by G. Y. and A. F. Dixon in 1891.

The Salem specimens exhibit three subtypes which correspond to those manifest in the Newport specimens, the proportions of individuals only being slightly different. I have arranged the Oakland specimens in two columns, the first enumerating them exactly as they are, the second on the assumption that half pairs represent incomplete full pairs. The only change which this latter method of enumeration has caused is a reversal of the relative importance of the forms with four and with seven pairs of non-directives respectively. In both columns the hexamerous is the dominant and only clearly marked type.

According to the first Oakland column, 53 polyps, or 21 percent, are hexamerous, in a total of 254; according to the second column, 64, or 25 percent, are hexamerous. Of these, 39, or 15 percent, are regular. Among the Salem polyps 31, or 23 percent, are hexamerous and approximately regular. Among the Newport polyps 20, or 26 percent, are hexamerous; how many of these are also regular is not stated.

TABLE III. DIGLYPHIC TYPE OF POLYPS.

| Groups of non-directives, | 0 | 1 | 1 | 1 | 1 | 1 | 2 | 2 | 2 | 2 | 2 | 2 | 3 | 3 | 3 | 3 | 4 | 5 | To- tal. |
|------------------------------|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|-------------|
| | 3 | 2 | 3 | 4 | 5 | 6 | 7 | 2 | 3 | 4 | 5 | 6 | 7 | 3 | 4 | 5 | 6 | 5 | |
| Oakland polyps, | 1 | 0 | 3 | 2 | 4 | 1 | 0 | 4 | 6 | 3 | 3 | 2 | 1 | 4 | 2 | 0 | 0 | 1 | 37 |
| Salem " | 0 | 2 | 1 | 0 | 2 | 2 | 0 | 4 | 2 | 3 | 2 | 0 | 2 | 0 | 1 | 1 | 1 | 0 | 23 |
| Newport " | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 2 | 2 | 3 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 20 |

Table III exhibits the variation not only in the number but also in the arrangement of the mesenteries of a limited number of diglyphic polyps. There is great discrepancy between the number of regular diglyphic polyps from Newport, on the one hand, and from Salem and Oakland on the other. I can offer no satisfactory explanation for this, since the methods of Dr. Parker's collector seem to have been similar to my own.

With the foregoing record before us, we may proceed with the discussion.

A complete explanation of variation in *Metridium* must account, among other things, for the variation

- (a) in the number of perfect mesenteries,
- (b) in the number of siphonoglyphs,
- (c) in the relative arrangement of siphonoglyphs and mesenteries.

(a) There is no direct evidence upon which to formulate the true numerical ratio of sexual to non-sexual individuals. Hence it is impossible to state whether or not all departures from the assumed regular diglyphic hexamerous type are non-sexually produced. It is probable

that basal fragmentation is accountable for a considerable proportion of them, since basal fragments are not uniform in size and number of included mesenteries and the latter may serve as fundamentals of the mesenteries of the new polyp. Why there should be three monoglyphic types, according to Parker's figures, or one according to mine, is a question that demands a more definite answer. It might be urged that the fragments tend to be of a certain size and include such a number of mesenteries as would give rise to six, seven or eight pairs of perfect mesenteries in the adult. In my experience the fragments vary too much in size and in number of mesenteries to support this idea. A more probable view was suggested by Andres in his work on *Aiptasia* in 1882. Fragments of this species, irrespective of their size and number of mesenteries, took on a hexamerous form and, what is more, showed indications of the two siphonoglyphs of the typical adult. I shall return to the latter point farther on. Even this tendency of the fragment to develop on the plan typical for the species hardly explains the *three subtypes* so conspicuous in the Newport specimens, unless these types are characteristic of both sexually and non-sexually produced polyps.

Basal fragments probably develop under the influence of both factors—size and hereditary tendencies. But I do not think it necessary to assume that all irregular polyps arise in this way or by means of some other *non-sexual* process. That *all regular, hexamerous, monoglyphic* polyps are non-sexually produced seems still less probable. This case will be considered in a succeeding paragraph. What it is important to notice here is, that although we are ignorant of the origin of *every* polyp with an irregular number of mesenteries, it is perfectly well known that hexamerous polyps may develop non-sexually. Further, since no one questions the fact that the Sagartids are fundamentally hexamerous and that the fundamental type is to be found, if anywhere, among the polyps produced from the egg, we may assert, despite the want of direct embryological evidence, that hexamerous polyps develop sexually also. Consequently, hexamerism is not determined by the method of reproduction.

(b) If now we turn to an examination of the causes for variation in the number of siphonoglyphs, we find that the method of reproduction is not one of these. I quote from my paper of 1898, p. 357, "Both monoglyphic and diglyphic polyps reproduce by fission; and both result from fission (figs. 3-7). Further, a bud from the œsophageal region may possess either one or two siphonoglyphs. One bud produced upon the foot disk had, at the time of liberation, but

one siphonoglyph. Again, . . . two buds were found to have arisen independently from a single basal fragment; the one is monoglyphic, the other diglyphic." The causes of such variation evidently lie deeper than the method of reproduction.

The same causes must account for triglyphic and polyglyphic forms also. While monoglyphic and diglyphic polyps may arise by fission and œsophageal budding and so derive their siphonoglyphs immediately from those of the parent, triglyphic and polyglyphic polyps probably arise in two ways only, viz: from egg embryos and from basal fragments. In *Metridium* only a fraction of one percent of the total number of polyps is triglyphic, and polyglyphism is unknown. Among seven specimens of *Sagartia spongicola*, according to McMurrich in 1897, only one had two pairs of directives, irregularly placed; one had four pairs; the others had three pairs each. Two were hexamerous, two heptamerous, and three octamerous. In four specimens of *Bunodes thallia*, G. Y. Dixon and A. F. Dixon found one siphonoglyph in one, two in another and four in another. In the same connection *Condylactis ramsayi* is mentioned as having from two to seven siphonoglyphs.

It is not, however, upon the arrangement of mesenteries alone nor the number of siphonoglyphs alone that the suggestion of a correlation between variation and method of reproduction is based, but rather upon the relation of these two sets of structures to each other. This brings us to the third point in the discussion.

(c) Under this head I hope to show that, with the possible exception of polyps with a non-typical number of mesenteries, it is not necessary to assume a correlation between structural type and mode of reproduction; but that, if there is any correlation at all, it exists more probably between the number of siphonoglyphs and the number of mesenteries, based upon ancestral tendencies and irrespective of reproductive processes. Polyps with a non-typical number of mesenteries are excepted because (1) many of them are produced by basal fragmentation and the cause of their non-typical condition is obvious; (2) they are not actually known to be produced from the egg. Whether the exception will persist when the development of *Metridium* is fully known remains to be seen.

That diglyphic hexamerous polyps develop not only sexually but non-sexually is established, I think, by the following considerations.

In the first place, I have already referred (p. 398) to a case of fission in which one member of the group was hexamerous and diglyphic, and approximately regular. I shall not insist upon this case

if it is objected to on the ground that the process of fission has not been observed from beginning to end, or that the web of tissue between the œsophagi is a true perfect mesentery. Possibly my view will not hold against either of these objections; yet the suggestiveness of the facts cannot be denied.

In the second place, there is a much more convincing consideration to be offered. We have seen that either one or two siphonoglyphs may occur in non-sexually produced individuals. We have seen also that hexamerism is not dependent on mode of reproduction. If, then, both hexamerism and the diglyphic condition may result separately from a non-sexual process, it follows, from the law of probabilities, that at some time in all probability the two will be associated. In that case, one in five of these diglyphic hexamerous polyps would be regular, according to the same law; since in a diglyphic hexamerous polyp one siphonoglyph and its pair of directives can occupy but five possible positions relative to one another, and one of the five must divide the non-directives into two equal groups of two each. It may be objected that this mathematical probability accounts for only a very few regular, diglyphic, hexamerous polyps. The number produced non-sexually is not known, it is true. But whatever it may be, non-sexual processes are accountable for it—and that is the first point to be noted.

If we turn to the general grounds which, in the third place, may be offered in support of the non-sexual origin of regular diglyphic hexamerous polyps, the objection in the last paragraph may be perceptibly weakened.

It is well known that buds tend to develop according to the parental type, among many groups of animals. The buds of *Hydra* are indistinguishable from the individuals upon which they grow. The buds of *Perophora* are identical with the budding individuals in all adult features, notwithstanding that some organs of the buds may not be developed from the same germ layers as are the corresponding organs in the sexually produced form. It is true that among the Cœlenterata, such forms as the hydroids exhibit a marked difference between the sexual bud and the individual which may produce it. Among the Ascidians also this same dimorphism is conspicuous. In these cases, however, dimorphism is associated with a division of labor which often involves an enormous change of function and may also be correlated with differences of environment.

In *Metridium* there is not the slightest reason for presupposing any dimorphism on any of these grounds. The species is not colonial and

polyps, both sexually and non-sexually produced, live under identical conditions, exercising identical functions side by side.

The development of the Scyphomedusæ offers an interesting case in point. Although ordinarily the *scyphistoma* of *Aurelia* gives rise by fission to *ephyræ*, itself remaining permanently attached, it may in some cases become transformed directly into the adult medusoid form.

Isolated blastomeres of the segmenting ovum, pieces of hydroids, flatworms sectioned in various ways—all make palpable efforts to develop into the form which is typical for the race to which each belongs. Finally, not to multiply illustrations needlessly, attention should be recalled to the case of *Aiptasia* already cited, which bears more closely on the present discussion than any of the others. On his Plate II, Andres has figured several series of stages in the process of basal fragmentation observed in *A. lacerata*. In the first series a single piece has been torn away from the foot, containing four larger and three smaller pairs of mesenteries, the two sizes alternating with each other. In the last figure of the series, two new pairs of large mesenteries have appeared on the side toward the wound, and between every two pairs is a pair of smaller mesenteries. Not only is the arrangement of the mesenteries strictly hexamerous, but Andres states that the siphonoglyphs correspond with the first and fourth pairs of mesenteries, a strictly regular arrangement. Moreover, pair I is one of the larger pairs not originally present. In the second series a larger fragment is followed which breaks up into three pieces. One contains four pairs of the larger mesenteries, another two, and the third one. By the time the end of the series is reached, each piece has transformed greatly. The largest and smallest are hexamerous, the second is tetramerous and promises better things.

With these facts before us, there is every reason for believing on *a priori* grounds that the buds from basal fragments of *Metridium* also tend to develop according to the ancestral type. These buds begin without siphonoglyphs as do the egg embryos. It is not easy to see why the latter should always develop two siphonoglyphs and the former one—or if two, why they should always be associated with an irregular number or arrangement of mesenteries. It is far easier to believe that sexual and non-sexual types are both monoglyphic and diglyphic. To explain the predominance of the hexamerous type in Parker's tabulation of diglyphic polyps (Table III), it might be assumed that on account of its long ancestral association with hexamerism, the diglyphic condition tends more strongly to occur in regular hexamerous polyps than in polyps with an irregular number or arrangement of

mesenteries. This assumption may gain in probability if the remarkable correlation of siphonoglyphs and directives is remembered, for an explanation of which we are equally at a loss.

The regular hexamerous diglyphic polyps must be relatively more numerous among the sexually than among the non-sexually produced polyps. This is because basal fragmentation is responsible for an important number of aberrant forms which must lessen the proportion of regular hexamerous diglyphic polyps among the non-sexually produced polyps. The portion of regular hexamerous polyps which are produced sexually to those which arise non-sexually cannot be stated at present.

Having given reasons for believing that regular hexamerous polyps develop non-sexually as well as sexually, it remains to consider whether monoglyphic polyps develop sexually as well as non-sexually.

There is no direct evidence for an affirmative view. If we assume, however, that buds tend to reproduce the structural type of the parent, and remember that polyps with either one or two siphonoglyphs arise non-sexually, the probabilities are very great that both monoglyphic and diglyphic polyps are produced sexually. The same causes that operate to produce a variation in the number of siphonoglyphs of the bud must also operate to produce a similar variation in the egg embryo. Since the ancestral type is hexamerous, it is safe to assume that this monoglyphic sexual type will be associated with hexamerous polyps. At least until the complete development is known we shall be unable to assert that irregularities in the mesenterial formula do not occur in the polyps which are sexually produced. That such irregularities may occur in the latter is suggested by the development of perfect mesenteries in polyps which have arisen by fission. As the fission plane separates the directives of the siphonoglyph through which it passes, a new directive must be developed for each individual. Often other perfect mesenteries arise between the separating œsophagi. It is clear that at least under the conditions which make fission possible new perfect mesenteries may be developed in sexually mature polyps.

In the foregoing discussion I have attempted to show :

(a) That regular hexamerous diglyphic polyps arise non-sexually as well as sexually ;

(b) That monoglyphic polyps arise sexually as well as non-sexually ;

(c) That irregularities in the number and arrangement of mesenteries may be accounted for largely, perhaps exclusively, by non-sexual reproduction (mainly basal fragmentation) ;

Proc. Wash. Acad. Sci., August, 1902.

(*d*) That variation of structural types is not correlated with mode of reproduction, but that the cause of such variation must be sought among the causes of variation in the number of siphonoglyphs, of the correlation of siphonoglyphs and directives, and the like. What these causes are is at present unknown.

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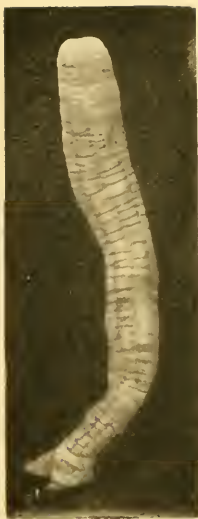
PLATE XXIV.

- FIG. 1. *Edwardsia sipunculoides*. Œsophagus everted.
2. Another specimen of the same contracted; physa adhering to pebbles.
3. Two other specimens, one (*b*) showing the place from which was taken the piece represented in text figure 5.
4. *Harenactis attenuata*. Oral region.
5. Aboral region of another individual of the same species.
6. *Charisca saxicola*, in various degrees of contraction.
7. " " " " " "
8. " " " " " "
9. " " Cross section below œsophagus.

NOTE.—All of the figures are reproduced natural size from photographs of preserved specimens.



1



2



3



5



4



6



9



7



8

Smith, Jr.

Smith, Jr.

PLATE XXV.

FIG. 1. *Cribrina artemisia*.

2. " "

3. " "

4. *Epiactis prolifera*, from specimens collected at Pacific Grove, California.

5. " " " " " " " "

6. *Epiactis ritleri*.

7. " "



1



4



5



2



3



6



7

Tomes, del.

Blanchard, del.

PROCEEDINGS
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PAPERS FROM THE HOPKINS STANFORD GALA-
PAGOS EXPEDITION, 1898-1899.

VIII.

ENTOMOLOGICAL RESULTS (7).

SCHISTOCERCA, SPHINGONOTUS AND
HALMENUS.

BY ROBERT EVANS SNODGRASS.

CONTENTS:

| | |
|--|-----|
| Introduction | 411 |
| Genus <i>Schistocerca</i> —general remarks | 412 |
| Races of <i>Schistocerca</i> | 413 |
| Relationships and evolution of the races | 415 |
| Detailed descriptions | 419 |
| Genus <i>Sphingonotus</i> —general remarks | 436 |
| Diagnoses of races | 437 |
| Relationships of races | 438 |
| Detailed descriptions | 439 |
| Genus <i>Halmenus</i> —general remarks | 447 |
| Detailed descriptions | 448 |

INTRODUCTION.

THE collection on which this paper is based consists of 176 specimens of *Schistocerca*, 124 specimens of *Sphingonotus*, and 17 specimens of *Halmenus*. Nearly all of these specimens were killed in cyanide of potassium and are preserved on pins. The paper was prepared under the supervision of Professor Vernon L. Kellogg in the entomological laboratory at Stanford University.

Only one Galapagos species of *Sphingonotus* has hitherto been described. This is *S. fusco-irroratus* of Stål, who says

that it occurs also on the island of Puná near Guayaquil, Ecuador. Likewise, only one species of *Halmenus*, *H. robustus* Scudder, has heretofore been recorded. The material here reported on, however, shows that there are on the Galapagos at least two species including seven races of *Sphingonotus*, and three if not four species of *Halmenus*.

Genus *Schistocerca*.

GENERAL REMARKS.

Two Galapagos species of *Schistocerca* have been described, viz. *S. melanocera* (Stål) and *S. literosa* (Walker). In neither case is it recorded from which island the *type* came, but all subsequent researches have shown that *S. melanocera* occurs on Charles, Barrington, Indefatigable, Jervis, James, Albemarle and Narboro, and that *S. literosa* occurs on Chatham, Hood and Tower. Scudder reports that one female of *S. melanocera* was collected on Chatham by Baur, and Butler accredits two specimens of *S. literosa*, collected by Darwin, to Charles Island. It is doubtful, however, whether both forms ever occur normally on the same island. It is well known that Darwin did not always keep his specimens from the various islands well separated. We saw neither *S. melanocera* on Chatham nor *S. literosa* on Charles, but in each case found the other species very abundant.

Both Wolf and Agassiz have stated that *S. melanocera* inhabits only the higher parts of the islands and *S. literosa* the lower. My own observations are wholly at variance with these statements. In both December and June *S. melanocera* was found in enormous numbers along the very edge of the shore at Iguana Cove, Albemarle, and was common up to 1,000 feet. Above this almost none were seen. The same was true at Tagus Cove, Albemarle. The grasshoppers were everywhere numerous on the low hills about the cove and at the base of the mountain two miles inland. On the sides of this mountain they were scarce, but a few were found all the way to the top, 4,000 feet. On Charles Island during May the species was abundant close to the shore at Black Beach, but was much less numerous in the upper parts of the island. Barrington is a low island, below 1,000 feet, and the species on it was just as abundant near the shore as farther inland. On Chatham *S. literosa* was common from the shore up to at least 1,500 feet. Hood Island has an elevation of only 650 feet, but the grasshoppers were just as abundant in the higher parts as near the shore. Tower Island is all low and flat.

Hence the two species are separated from each other not by a difference in habitat, but by a difference of geographical location, *i. e.*, one species is confined to one group of islands and the other species to another group.

If we had no specimens from Duncan Island the two first described forms of *Schistocerca* from the Galapagos could not be regarded otherwise than as two valid and well-separated species. A large number of specimens from Duncan, however, present such an amount of variation that they can be arranged in a closely graded series duplicating at one end the *melanocera* form and at the other the *literosa* form. At first sight this would appear to reduce these two supposed species to subspecies, but reasons will be given later for regarding the Duncan race as a hybrid.

RACES OF SCHISTOCERCA.

The specimens from the different islands show striking, though, in most cases, slight differences distinguishing the individuals of each island, as a race, from those inhabiting any other island. There are two exceptions. Abingdon and Bindloe have the same form, and Albemarle supports at least two races. Scudder was the first to point out the existence of races on the islands, but his material was alcoholic, and he could not, on that account, well describe such color differences between them as exist. Moreover, he had no specimens from Abingdon and Bindloe.

The following are the diagnostic characters of the various races. Detailed descriptions are given on pages 419-436.

S. melanocera melanocera (Pl. xxvii, fig. 1).—Of large size; yellow of metazona contrasts strongly with black of prozona, yellow spot on side of prozona distinct; abdomen uniform; terminal halves of tegmina immaculate.

From Charles Island.

This race may be regarded as typical of *S. melanocera*; and Charles Island is most probably the locality of Stål's *type* of this species.

S. melanocera minor.—Smaller than the Charles form; does not differ from it in color.

From Tagus Cove, Albemarle Island.

S. melanocera pallida.—Same size as the Tagus Cove form, but differs from this race in being of a generally paler color.

From Barrington Island.

S. melanocera lineata (Pl. xxvii, fig. 5).—Differs conspicuously from the Charles race in the presence of a distinct pale line along the side of the abdomen on the lower edges of the terga.

From Iguaña Cove, Albermale Island.

S. melanocera immaculata (Pl. xxvii, fig. 6).—Resembles the Iguana Cove form in the possession of a light abdominal stripe, but differs from *S. m. lineata* and from all the other races in lacking the yellow spot on the side of the prozona. Since Scudder had two specimens which he says show a very faint trace of the prozonal spot, it is probable that some may be found having it well developed. Its absence, however, is so conspicuous that the race is a very strongly marked one.

From Indefatigable Island.

The species inhabits also Jervis, James and Narboro Islands, but the material at hand from these islands is insufficient to determine the status of the species on them. The few Narboro specimens show affinities to both the Tagus Cove and the Iguana Cove races on Albemarle.

S. literosa discoidalis (Pl. xxvii, fig. 4).—Smaller than any of the *melanocera* varieties, of a paler general coloration, lacking strongly contrasting black and yellow markings; terminal half of tegmina spotted with conspicuous large quadrate dusky blotches; prozona but slightly shorter than metazona.

From Chatham Island.

This race may be taken as typical of *S. literosa*, and it is probable that the *type* of this species came from Chatham Island.

S. literosa hyalina.—Conspicuously paler than the Chatham form, reticulations of tegmina lighter; tegminal spots smaller; prozonal stripes less strongly marked; prozona shorter than metazona. Eyes slightly farther apart than in *S. l. discoidalis*.

From Tower Island.

The Chatham and Tower forms are of about the same size, each being smaller than the Hood variety.

S. literosa punctata.—Distinctly larger than either of the other two *literosa* forms; the prozona relatively shorter, less than four fifths as long as the metazona; tegminal reticulation as in the Chatham form, tegminal maculations very distinct.

S. intermedia intermedia (Pl. xxvii, fig. 3).—Characters vary in all degrees from those of typical *S. melanocera melanocera* specimens, to those of typical *S. literosa punctata* specimens.

From Duncan Island.

S. intermedia borealis (Pl. xxvii, fig. 2).—Resembles in coloration intermediate Duncan individuals; color relatively uniform; maculation of tegmina well marked.

From Abingdon and Bindloe Islands.

RELATIONSHIPS AND EVOLUTION OF THE RACES.

The characters of the species and their various races show little with regard to their interrelationships. If we leave out of consideration the Duncan specimens, there is no difficulty in referring the numerous other varieties to two well-separated species as has been done. Since, however, the Duncan specimens completely bridge over the wide gap between these two otherwise apparent species, we have a less simple problem to deal with.

Concerning the Duncan form we may make three suppositions as follows: (1) It may be an ancestral form, from one of whose extremes has been developed *S. melanocera* and from the other *S. literosa*; (2) it may be a variable race that on the one hand has varied toward *S. melanocera* and on the other toward *S. literosa*; (3) it may be a hybrid race formed by the intermingling of representatives of the other two species from the other islands.

There are several objections to (1). In the first place Duncan appears least likely of all the islands to have received the original *Schistocerca* population. It is situated near the center of the archipelago and is not more than three miles in its longest diameter. Structurally it consists of a circular extinct volcano, having an eccentric crater with a floor about a third of a mile in diameter and 475 feet above sea level. The rim of the crater is still perfect, rising in most places to a height of about 350 feet above the floor. At one point it is produced into a sharp peak having a height of about 1,000 feet. The island is dry and barren. The whole outer slope is covered by a thick growth of low bushes, but soil is present only on the floor of the crater. Animal life is almost entirely confined to the interior of the crater. It is on this small area, affording absolutely uniform environmental conditions, that the most variable form of *Schistocerca* in the whole archipelago is found. It is highly improbable that an island of this sort could have been fit for habitation earlier than such fertile and much disintegrated islands as Chatham and Charles. Moreover, the winds and currents are invariably from the southeast. Hence, Duncan is in a poor location to send migrants to the islands south and east of it. Furthermore, it is impossible to imagine any reason why variations representing the *literosa* form should have gone to Tower, Chatham and Hood and not to any of the neighboring islands. On the other hand, Duncan gets but little rain, and the appearance of an island cannot be taken as a definite indication of its age. The presence of a very strongly marked race of land tortoise on Duncan might be taken as evidence of a considerable age for the island.

On the whole, however, the evidence is against the supposition that the ancestral race of *Schistocerca* lived on Duncan Island.

Under (2) we may assume that the Duncan race is simply a variety of either *S. melanocera* or *S. literosa* that has varied in the direction of the other species. The great improbability of such an occurrence is sufficient to exclude this hypothesis. We may also assume that the individuals on all the islands once varied as do now those on Duncan, and that on Chatham, Hood and Tower the *melanocera* characters were suppressed while on Albemarle, Indefatigable, James, Charles and Barrington the *literosa* characters were suppressed. However, it appears highly improbable that islands so dissimilar as Tower and Chatham should have produced the same form, and that islands so much more nearly alike as Charles and Chatham should have produced forms so different.

Case (3), assuming the Duncan form to be a hybrid race, has no direct evidence in its favor. There is, however, nothing that can be urged against it. The central position of the island would permit stray individuals to be carried there by both wind and currents from Charles, Hood, Chatham, Barrington and Indefatigable. If the race is a hybrid then the incongruity of such a variable form inhabiting an island of so limited extent and of such lack in diversity of conditions is avoided. The assumption produces no discord with prevailing ideas concerning the relationship of environment and variation. However, as already stated, no direct evidence can be adduced in favor of the hypothesis. It is simply the only one that explains the facts and that cannot be disproved.

If, then, we regard the Duncan race as a hybrid, the relationships of the other races offers less difficulty. From a geological point of view Chatham and Charles are certainly the oldest islands of the archipelago. This is evident from (1) the disintegration of the surface lava, and (2) the destruction, by erosion, of the central craters. In the upper parts of the southwestern half of Chatham are large open fields of rich soil, strikingly contrasting with the condition of all the other islands except Charles and probably the upper part of Indefatigable. On Chatham are numerous rounded hills, giving evidence of long continued erosion, and there is no recognizable remnant of a central crater.

Charles Island appears newer than Chatham. The soil is thinner and less fertile. The surface rises gradually toward the center of the island where a number of high steep cone-like hills surround a central valley. These hills strongly suggest that they once formed the wall of a crater. Nearly all the other islands have well preserved craters, and

almost no soil covering the surface lava. Hood, James, Barrington and Tower probably never had a single central crater, but all of them, except James, show little evidence of age.

The winds of the archipelago are almost invariably from the south-east. The humidity of the region is so small that islands less than 1,000 feet in height have but little precipitation. Consequently high islands lying to the south and southeast are the most favorably situated for receiving rain. Chatham and Charles possess both of these qualities. Hence, on them the condition of the surface cannot be relied on as a definite index of their age. They may appear older than another island of the same age that is lower and less favorably situated. Hood is just as well located as either Chatham or Charles, but it is too low to condense much moisture.

The contrast is so great, however, between Chatham and Charles and the other islands, that we cannot but suppose, even after making allowance for all other influences, that they were at least the first inhabitable islands of the archipelago. Albemarle rises far above all the islands east of it. To be sure, air currents must reach it somewhat impoverished in humidity by Chatham, Indefatigable, Charles and James, but its perfect craters and great fields of barren lava attest its newness. James and Indefatigable appear to be older than Albemarle but younger than Chatham and Charles. What the relative ages of such low islands as Hood, Barrington and Tower may be, however, it is difficult to judge. The rainfall on them is so slight that they may have remained unchanged for a long time.

A more serious difficulty in judging the age of an island arises from the consideration that only its present surface may be recent. A much older and fertile surface may be buried beneath it. This is true of Narboro. Most of the surface of this island consists of unweathered and utterly barren lava. There occur, however, scattered over its sides numerous isolated patches of vegetation growing on a rather rich soil. These areas vary from a few rods to half a mile in diameter, and are walled in on all sides by the recent flows of lava that have covered all the remaining surface of the island. These flows have occurred at different times and each has been of small extent. On such an island a fauna might easily migrate from one place to another as successively occupied areas became covered up.

In conclusion, then, with regard to the relative ages of the islands, all we can affirm is that Chatham and Charles have the appearance of being the oldest and first habitable islands of the archipelago. As we have seen, *Schistocerca literosa* is represented on Chatham and *S.*

melanocera on Charles. The characters of the races of each species as given above do not throw any light on the question as to which is ancestral in each case. Since the Iguana Cove and Indefatigable races of *S. melanocera* differ from the others in having a pale abdominal band, it is probable that they are secondary; and since the Indefatigable race has the unique character of an entirely black prozona, it has probably been derived from the Iguana Cove race. Otherwise we receive no help on this point from a study of the specimens themselves. Any form, as far as we can see, could be the direct descendants of the ancestors of the others in the case of either species.

If Charles and Chatham Islands are, as they appear to be, the oldest habitable areas of the archipelago, then it is most probable that they were the first islands inhabited by representatives of *Schistocerca*. Adopting this view, it is very easy to explain the status of the genus at present on the archipelago. We can suppose that the original form became modified on Chatham to *S. literosa* and on Charles to *S. melanocera*. From Chatham, we can suppose, individuals migrated to Tower and to Hood—each island being more accessible from Chatham than from Charles—and on these islands became the races peculiar to them. In the same way representatives from Charles could have gone to Barrington, Tagus Cove and Iguana Cove, and from the latter place to Indefatigable. To explain the Duncan race we have only to imagine that individuals from both Chatham and Charles were landed upon Duncan, there producing its hybrid *literosa-melanocera* race. Finally, individuals from Duncan could have gone to Abingdon and Bindloe Islands and there produced the Abingdon-Bindloe race. This relationship is diagrammatically shown on Plate xxvi.

It is evident that we might retain the same lines of relationship, but turn the direction of migration the other way. That is, we might suppose that the Abingdon-Bindloe race is the ancestral one, that from it was produced the variable race on Duncan, and that individuals representing one extreme of this race went to Chatham or Hood and individuals of the other extreme to Charles. From these islands the other varieties could radiate as before. The chief objections to this view are first that Abingdon and Bindloe are not very old islands, and second that migrants would have both the prevailing winds and currents against them. If the archipelago were inverted in position so that the northernmost islands were farthest south and *vice versa*, and if the then southern islands appeared to be the oldest, we could easily regard the Abingdon-Bindloe race as the unmodified original species, the Duncan race as a variable form produced from the first, and the others as being

derived from the Duncan race. But, the facts being as they are, the seemingly less reasonable scheme outlined in the preceding paragraph appears to be the more probable course of the formation of the varieties as they at present exist on the different islands.

DETAILED DESCRIPTIONS.

SCHISTOCERCA MELANOCERA (Stål).

(Pl. xxvii, fig. 1.)

Acridium melanocerum STÅL, Eug. Resa. Ins. Orth., p. 326, 1861.

Schistocerca melanocera SCUDDER, Bull. Mus. Comp. Zool., xxv, p. 11, 1893.

From Charles Island.

Description of a Typical Specimen. Female.—Ground color of head black, markings yellow. Pattern of the latter is as follows: a median stripe on the vertex, dilating slightly on the frontal lunule, and then going downward as a narrow line on the frontal costa to between the antennæ; below each antenna, on the floor of the subantennal groove, a wide stripe extending to, and less distinctly for a short distance upon the clypeus, the two being connected by a fine line along the lower border of the front; a third stripe reaching from lower part of anterior margin of eye downward along anterior border of gena a little more than half way from eye to base of mandible; a fourth stripe arising from the lower part of posterior margin of eye and running downward along posterior border of gena to the inferior margin of this sclerite. Antennæ uniform dusky; labrum with a bluish tinge; palpi yellowish, spotted with black; compound eyes dark brown; ocelli yellow. Prothorax has prozona black with an irregular quadrate yellow spot on lateral angle of scutum. Metazona orange yellow with an encroachment of black from prozona along anterior border; posterior marginal thickening black, with a narrow line of black mottling just in front of it; otherwise punctate with black especially on dorsal aspect, yet the general orange-yellow color contrasts strongly with the black color of the prozona. Whole prothorax with a median dorsal yellow carinal stripe continuous anteriorly with the median stripe of vertex and extending posteriorly to caudal border of metazona. Prosternum pale brownish, spine uniform with rest. Exposed lateral parts of meso- and metathorax black, on each an elongate yellow area along posterior border of the episternum ending below on a level with the mesothoracic spiracle. Sterna of same segments dark brown. Color in dry specimens a pale clay-color. Abdomen dusky, sides of terga dark brown on the posterior part, forming a wide transverse band on the anterior segments, a narrow band on the posterior segments.

Prothoracic coxa, trochanter and femur black, with a yellow stripe along the anterior outer border extending two thirds of distance to distal end of femur. Tibia and tarsus mottled with yellow and black. Mesothoracic legs same as prothoracic except that the lighter color is orange rather than yellow. The pattern of the coloration of the metathoracic femur is of special importance because the modifications it undergoes amongst the different varieties are of a definite and graded sort. Its ground color is black and the markings are as follows: along the median dorsal and the lateral outer and inner lower carinae a very fine line of bright lake red; just above the outer lower carina a wide yellow stripe reaching a short distance back of the middle of the femur; a corresponding red line along the inner lower carina; saddled across dorsal surface from one upper carina to the other two large pale-red quadrate areas, the anterior the larger and separated from the posterior by a space equal to length of the latter, posterior border of second area lies just above caudal end of lower outer yellow stripe; continuous with the outer anterior angle of the anterior red area a yellow stripe running forward just above the outer upper carina to the cephalic end of femur where it curves downward so as almost to meet the lower yellow stripe; the lower outer and inner lobes of the posterior end of the femur with a yellow spot, and the upper lobes tipped with the same color. Metathoracic tibia and tarsus bright yellow; the upper end of the tibia, a row of small spots on the upper half of the outer surface, tips of the spines and tarsal claws, black.

Proximal halves of all longitudinal veins of tegmina bright lake red, otherwise premedian and postmedian areas of the forewings are distinctly differentiated. Membrane of premedian area pale lemon-yellow distally where most of the reticulations are of same color, but toward basal part of wing they are more yellowish and reddish. Reticulation and membrane of the distal two thirds of the postmedian area dark smoky-brown, while anteriorly the reticulations are yellowish, giving, especially on the side, just above the median vein, a lighter and more differentiated appearance to basal part of wing. Posterior wings pale lemon-yellow with strong infuscation apically.

Variations (11 specimens).—The majority of the specimens agree very closely with the *type*. The most frequent divergence is a tendency of the second red area of the hind femur to fuse across the lateral black space with the lower yellow stripe. Back of this second red area, there is, in many specimens, a more or less distinctly developed third spot between the second and the tip of the femur. In some the yellow and red colors are paler and the black less intense,

and there is often less black on the metazona than in the first specimen described. The abdomen is sometimes paler, due to a spreading of the brown over all the parts. There is only a slight variation in the intensity of the color of the tegmina.

The males and females differ from each other in no way except in size. Length of tegmina of *male*, 44, 41, 41, 48, 45 = 44 mm.; of *female*, 55, 56, 58, 55, 53, 49 = 54 mm.

SCHISTOCERCA MELANOCERA MINOR var. nov.

From Tagus Cove, Albemarle Island.

Description of the Type. Female.—The *type* of the Tagus Cove race on Albemarle is almost identical in color with the Charles Island example, differing from it only in the following points: metazona less distinctly contrasted with prozona, being of a dusky orange color rather than yellow as with the Charles Island specimen, so that the irregular black markings, although present, are less conspicuous; there is scarcely any black on the prothoracic femur; yellow areas of the episterna small and less conspicuous; red of the metathoracic femur paler, and second red area fused below, on left side, and almost so on right, with lower yellow stripe; third or posterior spot on the dorsal surface of femur well developed; color of abdomen uniform, being dark brown obscurely mottled with dusky; distal half of the postmedian part of the tegmina paler. Length of tegmina, 47 mm.

Variations (16 specimens).—The other specimens from Tagus Cove show but little difference in color from the Charles Island specimens; specimens can be selected that duplicate the *type* from Charles Island, while as a whole the specimens from the two islands present exactly the same variations. One difference, however, is noticeable in most of the Albemarle specimens and that is that the infuscation of the distal half of the postmedian part of the tegmina averages slightly less than in the specimens from Charles. In the specimens from both the islands the yellow of the basal part of the wing just above the median vein has a tendency to be so arranged as to show the dark color as a longitudinal series of blotches. In most of the Tagus Cove specimens the second red area of the hind femur is fused across the intervening black space with the yellow line, and at least an indication of the third dorsal spot is present in almost all. Length of tegmina of *male*, 39, 39, 36, 40, 38, 38, 41 = 39 mm.; of *female*, 50, 49, 44, 49, 43, 47, 48, 42 = 47 mm.

These figures show that there is a very considerable difference in size between the grasshoppers at Tagus Cove, Albemarle and the

grasshoppers of Charles Island. In fact the females of the former are but slightly larger than the males of the latter. This difference is especially noticeable to one collecting at the two places, and there can be no doubt that the smaller size of the Tagus Cove specimens is a character distinguishing them as a race from those inhabiting Charles Island. Scudder's sixteen males and seven females from Albemarle average considerably larger than those of the Stanford collection, but he does not state on what part of Albemarle they were collected, and, as will be shown, there is a different race at the south end of Albemarle, and there might be another on the east side.

SCHISTOCERCA MELANOCERA PALLIDA var. nov.

From Barrington Island.

Description of the Type. Female.—Similar to *S. m. minor* of Tagus Cove, but differing from the *type* of that variety in having the metazona of a pale yellow color with but little black, in having a pale yellow area on the side of the scutum near its lower margin, and in the larger size of the episternal yellow areas. Length of the tegmina, 51 mm.

Variations (11 specimens).—The Barrington specimens average distinctly paler than the Tagus Cove specimens. The infuscation of the apical half of the postmedian area of the tegmina is much less in the males than in the Tagus Cove males, the same area being marked with indistinct dark spots. The three females, however, have the tegmina about the same color as those of *S. m. minor*. They all possess the yellow spot on the angle of the scutum, and all the males and two of the females have a second less distinct and less well-defined blotch of the same color near the lower margin of the scutum and præscutum. Scudder's figure, drawn from a Barrington Island specimen, shows this lower yellow area. One Tagus Cove specimen also possesses this spot pretty well marked on each side.

Length of tegmina of *male*, 39, 40, 37, 38, 37, 42, 39, 39 = 39 mm.; of *female*, 49, 50, 51 = 50 mm.

The Barrington form is then closely related to the Tagus Cove form and is related to it more closely than to any of the other races. It differs from *S. m. minor* chiefly in the lighter colored tegmina of the males, and in the greater frequency of the lower yellow spot on the side of the scutum, the absence of this mark being exceptional while with the Tagus Cove form its absence is characteristic. Their affinities, hence, are not with the Duncan race as Scudder judged from his specimens.

SCHISTOCERCA MELANOCERA var.?

From Jarvis Island.

Scudder had one male specimen from this island, which he says "is almost an exact duplicate of some of the similarly sized males from Albemarle Island, with faintly infumated wings." There are, however, at least two distinct races on Albemarle, so that the relationship of the Jarvis form must be left doubtful since we did not visit this island.

SCHISTOCERCA MELANOCERA LINEATA var. nov.

(Pl. xxvii, fig. 5.)

From Iguana Cove, Albemarle Island.

Description of the Type. Female.—Differs in the following characters from *S. melanocera melanocera*: abdomen very dark brown, lower edges of the terga yellow, forming a conspicuous stripe along the side of the abdomen; meso- and metasterna dark olivaceous-slaty, with a pale stripe on each side reaching from the mesocoxa to the anterior border of the mesosternum just back of the anterior coxa. Length of the tegmina, 53.5 mm.

Variations (18 specimens).—This variety is very distinct from the race at Tagus Cove on Albemarle, and, as will be shown, possesses the lateral abdominal stripe in common only with the Indefatigable and Seymour variety. Hence it appears to be related on one hand to the form inhabiting these islands and on the other to the Tagus Cove and the Charles races. All of the specimens have the lateral stripe on the abdomen, although its intensity varies. This mark is present on two of the Tagus Cove specimens but is much less distinct than in the majority of the Iguana Cove specimens. The lateral pale lines on the mesosternum are present on some of the Tagus Cove specimens as a mere suspicion of their existence.

Length of tegmina of *male*, 39, 40, 39, 38, 38, 39, 40, 40 = 39.1 mm.; of *female*, 55, 53, 48, 54, 45, 54, 52, 50, 50, 48 = 50.9 mm.

SCHISTOCERCA MELANOCERA IMMACULATA var. nov.

(Pl. xxvii, fig. 6.)

From Indefatigable Island and South Seymour Island.

Description of the Type. Male.—Agrees most closely with *S. m. lineata* of Iguana Cove, but differs conspicuously from the *type* of that race as follows: frontal costa and entire lower part of face including the clypeus and labrum yellow, except for a slight brownish area just below frontal ocellus; metazona bright pale yellow; *no yellow spot on*

the angle of the scutum; yellow spots on episterna entirely absent on left side, minute on right side; abdomen more blackish, with yellow borders to lower ends of terga but also with the posterior margin of both terga and sterna yellow. Length of tegmina, 42 mm.

Variations (6 specimens).—In coloration the specimens agree with the *type* in lacking the yellow spot on the angle of the scutum, none of them showing the least trace of it. This character separates this race very distinctly from all the other forms so that it, more than any of the others, deserves the rank of species. Scudder had six males and seven females from Indefatigable Island, and he states that all except two lack this spot, these two, however, showing but "a faint trace of it." One female has the entire face yellow as in the *type* but the others resemble the forms already described in the coloration of the head. The inferior surface of the meso- and metathorax is, in most of the specimens, slaty-olivaceous, but the lateral stripes on the mesosternum from the pro- to the mesothoracic coxal cavities are generally not very distinct although faintly present. All have the abdominal terga bordered inferiorly with pale yellowish, strongly resembling in this respect the Iguana Cove form, but differing from them in that the color is present also on the entire posterior margins of the segments, extending more or less distinctly entirely across the dorsal aspect of the abdomen and conspicuously bordering all the sterna. The color of the tegmina exactly duplicates that of the Iguana Cove specimens.

Length of tegmina of *male*, 42, 42, 45 = 43 mm.; of *female*, 61, 59, 45 = 55 mm.

These figures are slightly greater than those given by the measurements of the Charles Island specimens. Scudder's measurements also show that the Indefatigable form is the largest. In collecting on Seymour Island after being on Albemarle the greater size of *S. m. immaculata* was strikingly conspicuous. This race is, therefore, although very distinct, more closely related to that at Iguana Cove than to any other, differing from *S. m. lineata* in the larger size and in lacking the lateral spot of the scutum.

SCHISTOCERCA MELANOCERA var.?

From James Island.

When we visited James Island in April, specimens of adult *Schistocerca* were extremely scarce and no specimens were secured. Immature specimens were everywhere abundant. About the time the young are born the old ones die. Scudder had one male and two females from this island, and, according to him, they most closely resemble the

Indefatigable specimens, differing from them in having the lateral spot on the scutum "tolerably distinct in all, and in one very fairly marked."

SCHISTOCERCA MELANOCERA var.?

From Narboro Island.

There are only three specimens in the collection from Narboro Island, and they do not agree with one another nor with any other one form. One specimen resembles the Iguana Cove specimens of Albe-marle; it has the lateral stripe on the abdomen well marked, contrasting strongly with the very black color of the rest of the abdomen, although the stripe itself is reddish-brown. One of the other two specimens differs from the first in having the lateral abdominal stripe not so distinct. The third specimen, a male, differs from the first and second in lacking the abdominal stripe and in having the abdomen and the ventral surface of the thorax pale. This one resembles the specimens from Tagus Cove. The distance between Narboro and Tagus Cove is only about three miles and it is scarcely to be supposed that the grasshoppers do not sometimes cross from one island to the other.

Length of tegmina of male, 40 mm.; of female, 50, 47 = 48.5 mm.

SCHISTOCERCA LITEROSA (Walker).

(Pl. xxvii, fig. 4.)

Acridium literosum WALKER, Cat. Derm. Salt. Brit. Mus., iv, p. 620; v, Suppl., p. 63.—BUTLER, Proc. Zoöl. Soc. Lond., 1877, p. 88.

Schistocerca sp. BRUNNER, Proc. U. S. Nat. Mus., xii, p. 193.

Schistocerca literosa discoidalis SCUDDER, Bull. Mus. Comp. Zoöl., xxv, p. 16, 1893. (Chatham Island.)

From Chatham Island.

Scudder has tabulated characters on which he separates the *Schistocerca* of Chatham, Hood and Tower Islands into three distinct races, and these races he designates by variety names. The collection here reported on is much more extensive than that of Scudder, being represented by sixty-four specimens from the three islands, and, while some of Scudder's characters do not hold, the most important ones do.

Description of a Typical Chatham Specimen, Female.—Head dull reddish-brown with black and obscure yellowish markings; a black stripe extending from middle of posterior border of eye backward and downward to pronotum, split by a narrow line of the general color of head; just below eye a small black spot; space back of this and below post-ocular stripe and extending to lower border of gena slightly paler and more yellowish than rest of head; two rows of irregular black punctations on vertex on each side of median line.

Antennæ pale at base, beyond this dusky, the segments ringed distally with narrow marginal band of yellowish. Pronotum yellowish-brown, irregularly punctate with black, metazona with a reddish-brown diffusion, especially posteriorly; upper part of side of prozona with two poorly defined black stripes, one continuous with upper half of post-ocular stripe and the other with the lower. Meso- and metathorax same color as pronotum, punctate with black on sides, paler and without black spots below. Prothoracic and mesothoracic legs same color as thorax, marked with small black spots; metathoracic femur paler than rest of body, with a row of distinct black spots along upper and lower outer carinæ, lower ones being the larger, two very indistinctly outlined black saddle spots across the dorsal half, one just in front of, the other just behind, the middle, femur terminally dusky; tibia color of rest of the body with spines yellowish, tipped with black, a row of small black spots along inner side of tibia. Tegmina with no differentiation of membrane of the pre- and post-median areas, veins of the latter, however, all dusky, those of former paler brownish; dorsal surface of closed tegmina with distinct rusty tinge; on sides numerous black maculations, basally these are especially black and are elongated, distally they are paler, smaller and more equal-sided. Abdomen light brown with terga mottled with irregular longitudinal black streaks.

Length of tegmina, 34 mm.

Variations (16 specimens).—The head is generally almost uniform dull yellowish, yellowish-brown, or reddish-brown, with the posterior part of the genæ yellowish in all cases. The post-ocular stripe is always present. The prozona has generally a broad, pretty distinct black band along the upper part of the lateral lobes, continuous in front with the black post-ocular stripe. Sometimes this band is solid black, sometimes it is entirely split lengthwise by a yellowish band, and sometimes the yellow forms merely a small spot in the black, in which case the spot is on the scutum. Below this the prozona is dull yellowish-brown, dorsally it is darker. The metazona is in nearly all cases uniform brown. The black blotches on the hind femora are generally not so well formed as on the Hood Island specimens, and the black longitudinal connecting band is seldom present. There is a distinct tendency toward a yellow coloration of the median dorsal part of the pronotum and of the inner margins of the tegmina, making a median dorsal yellowish band. This is well marked in some and in others entirely absent.

Length of tegmina of *male*, 26, 28, 29, 27, 24, 27, 28, 30, 28, 27 = 27.4 mm.; of *female*, 33, 32, 34, 32, 34, 36 = 33.5 mm.

Length of prozona : 7, 6.5, 6, 7.5, 6.5, 6.5, 6.5, 6, 6, 6 = 6.4 half mm.

Length of metazona : 8, 7.5, 7, 7.5, 7, 6.5, 6.5, 7, 6, 5.5, 7 = 6.8 half mm.

Prozona : metazona = .94.

SCHISTOCERCA LITEROSA HYALINA Scudder.

Schistocerca literosa hyalina SCUDDER, Bull. Mus. Comp. Zool., Vol. xxv, p. 16, 1893. (Tower Island.)

From Tower Island.

Description of a Typical Specimen. Female.—Differs from the specimen described from Chatham as follows : black below eye extending farther ventrad, defining more distinctly the yellowish color of posterior part of genæ ; a small black area just above base of mandible ; punctations along each side of median line of head fused into two bands leaving a longitudinal median yellow stripe well defined between them ; post-ocular stripe present, less conspicuous and very indistinctly divided by lighter color. Lateral stripes on prozona exactly as on the Chatham specimen ; a faint indication of a median dorsal stripe on prozona ; punctations of meso- and metathorax and of first and second pairs of legs fewer ; small spots along upper outer carina of hind femur absent, those of lower carina present but much smaller ; large black dorsal areas of posterior femur much more distinct and better defined, a third one indistinctly present in front of the first one of the Chatham specimens ; maculations of tegmina fewer and fainter especially distally, only one spot on each side on the premedian area ; reticulations of tegmina all pale gray, except on dorsal surface of closed tegmina where they are brown ; veins reddish basally, brown mesially, gray terminally.

Variations (14 specimens).—The Tower Island specimens differ from those of Hood and Chatham in being of a conspicuously paler coloration, due mostly to the paler reticulations of the tegmina. The pattern of the coloration agrees more closely with that of the Hood specimens than with that of the Chatham specimens. The black bands inclosing a yellow one along the upper parts of the lateral prozonal lobes are well marked but average a little paler than on the Chatham Island specimens. The post-ocular stripe is present on the head in all. In respect to the intensity of the lateral prozonal stripe the Tower specimens are intermediate between those of Chatham and those of Hood. Below the lower black stripe the color is uniform dull yellowish-brown. The median dorsal prothoracic stripe is obso-

lete on most of the specimens, but the median stripe of the vertex is somewhat more distinct. The black dorsal spots of the posterior femora are not united in any of the specimens by a lateral black band. The maculation of the tegmina is very distinct but the spots are not so large as on the Chatham Island specimens, resembling more the Hood Island form in this respect. The antennæ are either uniform dusky throughout or have the basal segments pale yellowish and those beyond bordered distally with the same color.

Length of tegmina of *male*, 27, 29, 28, 27, 29, 27, 27, 27 = 27.5 mm.; of *female*, 35, 34, 32, 34, 35, 33 = 34 mm.

Length of prozona: 6, 6, 5.5, 7, 6, 7, 7, 6.5, 6, 6 = 6.3 half mm.

Length of metazona: 7, 7, 6.5, 8, 6.5, 7.5, 7.5, 8, 6, 6.5 = 7.1 half mm.

Prozona: metazona = .88.

The above figures show that there is little difference in size between the Chatham and Tower specimens. The relative length of the metazona, however, is considerably greater than in the Chatham specimens, where the metazona is but slightly longer than the prozona. In this respect also the Tower form is midway between those from Chatham and those from Hood. Scudder showed that this is true of the specimens he had. As also stated by Scudder, the space between the eyes of the Tower specimens is relatively greater than that between the eyes of the Chatham specimens. All of the latter have the space between the eyes on the vertex much narrower than the narrowest part of the frontal costa, while, in the Tower specimens, this space varies from the width of the frontal costa to slightly narrower.

SCHISTOCERCA LITEROSA PUNCTATA Scudder.

Schistocerca literosa punctata SCUDDER, Bull. Mus. Comp. Zool., Vol. xxv, p. 16, 1893. (Hood Island.)

From Hood Island.

Description of a Typical Specimen. Male.—The coloration is very similar to that of the Chatham and Tower specimens. The Hood specimen presents the following characters: on the head, in addition to the pale yellowish area of the posterior part of the gena, there is a similarly colored but poorly defined area beneath the eye; a median stripe on vertex extending on front to between antennæ of same color, on vertex this stripe bordered on each side by a band of dusky, between which and the post-ocular stripe is a broad yellow area; lower part of front dusky; clypeus and labrum dull brownish-yellow, mottled with black; metazona uniform brown; prozona same color on

dorsal surface, somewhat invaded by yellowish, at the lateral angle a faint narrow longitudinal band of yellow, below this a similar band of black, and below this again a second yellow band slightly wider than the upper, below which and reaching the lower margin of the prozona punctate black; thoracic sterna alike in color, pale leathery brownish-yellow; sides of meso- and metathorax dull yellowish-brown, somewhat browner than the sterna, with small amount of dusky infusion; a pale yellowish median carinal stripe on pronotum; fore and middle legs of same color as sides of mesothorax, both femora and tibiae marked with small black spots; ground color of hind femur about same as color of metasternum; on dorsal aspect of femur, reaching across from middle of one side to middle of other, three large rectangular black areas, between which are yellowish areas of same size, the first is a little in front of middle of the femur, the most posterior terminal and the median half way between the other two, lower margin of the first and the second indistinctly united by a faint longitudinal black band; rest of the femur shaded with brown, and along the outer lower carina punctate with black; abdomen plain brown; tegmina pale brownish, paler and somewhat yellowish, on premedian part, postmedian area maculate with quadrate dusky spots, largest and blackest anteriorly.

Variations (34 specimens).—In some specimens the color of the body is almost uniform dull reddish-brown, paler and more yellowish beneath with most of the markings on the head obsolete and those on the prozona very faint. The lower black stripe and upper yellow one of the prozona are the most persistent markings. In most of the specimens there is present with varying distinctness a black stripe just above the upper yellow stripe, so that the markings of the prozona are better described as a black longitudinal band on the upper part of the sides, split with yellow, below which is a wide yellowish area and between it and the lower margin of the prozona the color is punctate black. In some cases the upper yellow band is almost obliterated by a fusion of the two bordering black stripes, or the yellow is left as a small spot in the middle of a wide black band. In other cases both the yellow and the black are obscure, or the yellow forms a small spot at the angle of the scutum with a slight amount of black below it. The postocular stripe of the head is in most cases split longitudinally with yellow and the two parts are continuous with the two black bands of the prozona. The head in most cases has a faint median stripe on the vertex continuous posteriorly with the equally faint median stripe on the pro- and metazona. The latter stripe is lacking in only a few

cases. The antennæ are generally pale basally but otherwise dusky. The black spots of the femora are in some cases indistinct and not connected by a lateral black band. The black punctations of the lower outer carina of the femur and of the side of the tibia are persistent. In most cases the large black spots of the femur are well marked and in some cases have their lower outer ends connected by a very wide, distinct lateral black band leaving only a narrow stripe of yellow below it. Also, the specimens show a tendency in the species, toward the formation of a fourth black spot just back of the trochanter of the hind leg. This spot is united with the lateral external black band of the femur, as are the other spots, when this band is well developed. The maculation of the tegmina varies considerably, the spots being in some cases indistinct and in others very black, especially basally, where they are also sometimes considerably fused; but in general the markings are very prominent. The posterior wings are uniformly pale.

Length of tegmina of *male*, 32, 30, 31, 37, 33, 33, 31, 33, 32, 30, 31, 31, 33, 31, 32, 31, 30 = 31.8 mm.; of *female*, 40, 40, 41, 39, 39, 38, 38, 36, 35, 39, 35, 38, 35, 35, 37, 38, 36 = 37.6 mm.

Length of prozona: 7, 6.5, 7, 6.5, 7.5, 7, 7, 7, 7, 6.5 = 6.9 half mm.

Length of metazona: 8, 8, 9, 9, 10, 9.5, 9, 9, 8, 8 = 8.75 half mm.

Prozona: metazona = .79.

Though the *literosa* forms closely resemble one another as the preceding descriptions show, yet each possesses several distinguishing characters. *S. l. punctata* of Hood is distinctly larger than the varieties on Chatham and Tower Islands which are of about the same size. The length of the metazona, measured along the mid-dorsal line, compared with the length of the prozona, is much greater in the Hood Island race than in the Chatham Island race, while those on Tower are intermediate between the others in this respect. The space between the eyes as compared with the least width of the frontal costa, is certainly, as pointed out by Scudder, narrowest in the Chatham Island specimens and widest in the Tower Island specimens, being in the former much narrower than the narrowest part of the frontal costa, and in the latter varying from the width of the frontal costa to very slightly narrower. The Hood specimens all have the space between the eyes on the vertex narrower than the least width of the frontal costa, but the difference in this respect between them and the Tower specimens is scarcely perceptible. The specimens do not show the differences in the punctation of the frontal costa above the ocellus, nor of the metazona, mentioned by Scudder. The lateral black stripes on the lateral lobes of the prozona average a little darker on the Chatham specimens

than on those of Tower; and, in all, the post-ocular stripe is present on the head, being not absent on the head in the Tower specimens as tabulated by Scudder for his specimens. On the Hood Island specimens the lateral prozonal markings average much less distinct than on those from Tower or Chatham. With regard to this character, then, the Tower specimens are intermediate between the other two but closer to the Chatham form. The maculation of the tegmina is certainly darkest and the spots are largest, especially basally, on the Chatham specimens, while in this respect the Hood and the Tower specimens are almost identical and do not show the differences described by Scudder from his specimens. The differences in the color of the veins and reticulation of the post-median area of the fore-wings, pointed out by Scudder, namely that the Tower form has these parts pale gray and the others brown, is true of all the specimens, and gives the Tower race a paler appearance.

These comparisons show that no one of the three varieties is more closely related to one than to the other of the other two. *S. l. hyalina* of Tower is the only one that possesses a character not shared in some degree by the other two—the pallid color of the veins and reticulations of the fore-wings distinguishes it from the others—and hence it is probable that the Tower race has been derived from the inhabitants of one of the other islands, rather than that the others were produced separately from a form with pale wing veins. However, since either of the brown-veined forms may have been derived from the other after it had come from a pale-veined form, there is no certain evidence at all that any one rather than either of the others might be the ancestral race.

SCHISTOCERCA INTERMEDIA sp. nov.

(Pl. xxvii, fig. 3.)

From Duncan Island.

Description of the Type. Female.—General color of the head yellow, a brownish area at lower end of frontal costa, clypeus and labrum with dusky markings, frontal lunule dark on sides, a post-ocular stripe present narrowly split with yellow, a short black stripe extending from lower border of eye half way down middle of gena, a distinct yellowish vertical stripe reaching to frontal costa, space between this vertical stripe and the eyes and post-ocular stripe punctate with black, a few black punctations on anterior edge of gena below front of eyes. The general color of the head is thus marked off by the black into several areas; one of these is along the posterior part of the gena from the post-ocular stripe and eye down to the lower border of the gena; another is below the anterior part of the eye in

front of the subocular stripe and back of the black punctations along the anterior edge of the gena; a third is in front of these spots and laterad of the frontal costa, occupying the subantennal groove. It will be seen from this description that these areas correspond exactly with the yellow markings of the sides and front of the head of all the *S. melanocera* forms. Prozona with a very distinct median yellow stripe continuous in front with the median yellow stripe of vertex and posteriorly extending rather reduced across metazona; dorsal parts of prozona to level of post-ocular stripe, dusky, very slightly darker along outer margin, on the angle of scutum and scutellum a wide yellow band, below this the sides of the prozona reddish-brown with an admixture of dusky showing a tendency to intensify along the lower margin of the yellow above. This character, therefore, recalls the yellow stripe along the angle of the prozona in the *literosa* forms, with a black stripe above and another below it. Metazona in general paler than prozona, uniform reddish-brown, contrasting conspicuously with the darker colored prozona; along the anterior border an infusion of dusky, especially above, from the prozona, and punctations of the same color along the posterior margin. Sides of meso- and meta-thorax plain reddish-brown, lower surfaces uniform, darker than the sides. Abdomen brown with black streaks.

Prothoracic and mesothoracic legs reddish-brown with black mottlings. Metathoracic femora with the general color yellowish; entire inner surface between the two inner carinae, except a short space just in front of posterior swelling, black. Two large black spots on dorsal side reaching from inner black area to middle of outer side; from anterior one of these spots a line of black mottling runs forward along middle of femur to near anterior end; lower lateral lobes of posterior enlargement yellow, upper lobes black with yellow tips, space between on dorsal surface posteriorly yellowish with brown spots, anteriorly black; lower outer and lower median carinae, with a row of small black spots. Tibiae plain yellow, with obsolete dark spots along upper parts of sides, spines black-tipped. Tegmina with the veins pale reddish-brown, the reticulation of the post-median area gray or grayish-brown, those of the premedian area pale gray, post-median area with distinct dark quadrate maculations, most distinct anteriorly where they are also elongate and crowded; posterior wings almost uniform pale with a very slight apical infuscation. Length of tegmina, 53 mm.

Variations (25 specimens).—The specimens from this island form as a whole a well-marked race, but present a great amount of variation

amongst themselves. In general they are of a conspicuously grayer coloration than any of the *S. melanocera* forms and this character is especially noticeable when they are observed flying in the field, being conspicuous mainly on account of the paler colored tegmina and the almost uncolored posterior wings. One specimen, the least typical of the lot, is almost an exact duplicate of any typical Charles Island specimen, differing from the Charles *type* figured merely in having the median red dorsal area of the hind femora almost fused with the lower yellow line, and in having the third dorsal spot present on the femur. Also there is a row of small spots along both sides of the upper end of the tibia. These characters, however, are possessed by many of the Charles specimens. On the head the yellow bands before and behind the eye are fused along the lower part of the gena, but one Charles specimen duplicates this character. The distal part of the tegmina in some of the Duncan specimens, has exactly the same shade as in the Charles specimens and entirely lacks maculations. The average size of all the specimens from Charles and of all from Duncan is practically the same. On the other hand, specimens at the opposite end of the series are indistinguishable in color from Hood Island specimens. One specimen, in fact, resembles the typical Hood Island specimens even more closely than the one just described resembles the Charles *type*. On the lateral angle of the prozona is a pale yellowish band extending the whole length of the prozona, above it is faintly and narrowly bordered with black (the median dorsal part of the prozona being reddish-brown), below it is an indistinct band of equal width of punctate black, below this again is an indistinct band of yellow and from this to the lower border of the prozona the color is yellowish, finely spotted with black. This is exactly the same pattern as is present on the Hood Island specimens. Large and small black markings are present on the hind femora exactly the same as on Hood specimens, and the left tibia is spotted above on the outer side. The head is almost uniform yellowish-brown with faint black post-ocular bands. The antennæ are pale reddish-brown basally but dusky beyond. The abdomen is plain brown.

In general the specimens show a strong tendency toward a uniformity of coloration; the yellow markings of the head are in most cases fused across the separating black spaces so as to almost obliterate the latter. The metazona in most cases is not nearly so distinctly differentiated from the prozona in color as in the *melanocera* forms, the uniformity being due to a diffusion of the dark color of the prozona into the yellow of the metazona. As shown in the drawing of the *type*

from this island the yellow at the angle of the scutum extends to the posterior border of the scutellum. The yellow has spread over the top of the head so that the general black color is confined to a post-ocular stripe between the color of the vertex and the post-genal yellow stripe of the *melanocera* form. Furthermore, this black post-ocular stripe is split longitudinally with yellow. This replacement of the black by the yellow until the latter becomes the ground color and the black appears as markings is characteristic of the whole Duncan race, yet the specimens grade imperceptibly from the extreme representing the Hood *type* into that representing the Charles Island *type*.

The sides of the mesothorax and of the metathorax are in all nearly uniform brownish-yellow. The abdomen is brown with black mottlings and without pale borders to the segments. The hind femora are generally of a rather faded appearance but possess most of the black *melanocera* femoral markings undiminished in size. The tegmina of nearly all are grayish in color, being noticeably so when a specimen is seen alive flying, and the reticulation is almost everywhere pale. The maculations are as described in the *type*. The longitudinal veins vary from red to a reddish-brown—a vein-color not present in any of the *melanocera* forms, being more nearly the vein-color of the *literosa* varieties. The posterior wings are plain as in the *type*.

There can be no doubt that this race is intermediate between the forms from Charles and from Hood and it is evident that the change in color pattern from the Charles *type* to the Hood *type* consists of a spreading of the yellow markings of the former over the black ground color until the relationship of the two colors is reversed, and the black appears as markings on a yellowish ground. In addition to this difference of color pattern there is a difference of general tone of coloration, and of presence and absence of markings on the tegmina.

Length of tegmina of *male*, 42, 44, 44, 43, 44, 42, 42, 41, 43, 41, 41, 42 = 42.3 mm.; of *female*, 54, 50, 53, 54, 54, 53, 47, 52, 54, 54, 56, 55 = 53 mm.

In general the Chatham Island form presents fewer variations in the direction of the Duncan variety than does the Hood Island form, and such variations as are in that direction do not go nearly so far as do some of the variations found amongst the Hood specimens, but tend rather to connect the Chatham race with the typical specimens from the latter island. The Hood race, therefore, is intermediate between the Duncan race and the Chatham race. The relationship holds specially with regard to size, the Hood form being the largest of all the *literosa* varieties.

SCHISTOCERCA INTERMEDIA BOREALIS var. nov.

(Pl. xxvii, fig. 2.)

From Abingdon and Bindloe Islands.

Description of the Type. Male.—From Abingdon Island. Head almost uniform pale yellowish-brown; on the vertex two brownish stripes arising between eyes and diverging somewhat backward, inclosing between them a yellowish median stripe which is lost in front in the general pale color of the head; two excessively faint post-ocular stripes on each side running downward and backward; antennæ color of head basally, otherwise dusky; eyes uniform in color with head. Entire prothorax almost uniform yellowish-brown; a very faint median dorsal stripe of yellowish scarcely reaching posterior border of metazona; a well-marked but pale longitudinal yellowish area on angle of scutum and scutellum, very faintly bordered above and below by dusky; metazona bordered posteriorly by a row of very indistinct dark spots; most of pronotum minutely punctate with black. Sides of mesothorax and metathorax colored as pronotum, sterna of same segments paler and not punctate. General color of abdomen uniform with that of thorax, the sterna being paler than the terga, the latter streaked longitudinally with short indistinct curved black lines.

Fore and middle legs uniform yellowish-brown. Metathoracic femora slightly paler than body; two pale dusky quadrate blotches on the dorsal half, reaching from middle of outer to middle of inner side, the anterior on the inner surface of femur spreading out so as to form a large diffused black area anteriorly between the upper and lower carinæ; the lower outer ends of the dorsal blotches are connected by a longitudinal line of indistinct black punctations; a row of small black spots along lower outer and the ventral median carinæ; inner lower carina reddish; lower lobes of posterior femoral enlargement yellow, upper lobes black, tipped with yellow, dorsal surface between them pale, spotted with black; dorsal surface of femur tinged with reddish, upper median carina conspicuously red with small dusky-red spots along its entire length. Posterior tibia mostly plain yellow, upper end and tips of spines black, a few very indistinct dusky spots on outer side above.

Tegmina darker than body; reticulation of premedian area pale gray, membrane pale; reticulation of post-median part brown, membrane everywhere infuscated. The longitudinal veins bright red basally; large dark quadrate maculations distinct, crowded basally. Posterior wings strongly infumated apically. Length of tegmina, 38 mm.

Variations (18 specimens).—In color the Abingdon specimens differ decidedly from any others so far described in having the yellow color of the head and thorax predominant over the black, and the red of the posterior femora predominant over the black there. In many there are distinct indications of black markings as in the *type*, but in others the color is a uniform dark reddish- or yellowish-brown with scarcely any indication of yellow and black. There is no contrast at all between the prozona and the metazona. Those that have the prozona darkest have a well-developed yellow spot at the angle of the scutum on each side. The wings of the darkest specimens are darker than the wings of those with pale colored bodies, but in all the maculation of the fore wings is well marked and closely resembles the maculation of the tegmina of the Duncan Island specimens, being in most cases better marked than in the *type* figured.

Length of tegmina of the Abingdon specimens, *male*, 36, 36, 38, 37, 35 = 36.4 mm.; *female*, 47, 47, 47, 48 = 47.25 mm.

The Bindloe specimens differ in no way from those on Abingdon and it is apparent that those from the two islands represent but a single species. Although the specimens present numerous variations amongst themselves yet they are as a whole distinctly separated from any other race.

Length of tegmina of the Bindloe specimens, *male*, 37, 35, 43, 37 = 38 mm.; *female*, 47, 50, 49, 50, 49 = 45 mm.

From the above descriptions it is easily seen that the Abingdon-Bindloe race certainly resembles most the intermediately-colored individuals on Duncan Island.

Genus *Sphingonotus*.

GENERAL REMARKS.

This genus inhabits the central and southern islands of the archipelago, being known only from Albemarle, Indefatigable, Barrington, Chatham, Hood and Charles. Furthermore, it is for the most part, found only in the dryer parts of these islands. For example, on Albemarle it is present on the arid region about Tagus Cove, but is absent in the humid district about Iguana Cove.

The seven races, into which the Galapagos specimens may be separated, form two groups that appear to constitute two closely related species. One group inhabits Chatham, Albemarle and Indefatigable; the other inhabits Barrington, Hood, Charles and Indefatigable. The occurrence of two races on Indefatigable may be regarded as evidence of the presence of two species.

Since Stål described *S. fusco-irroratus* from Puná Island and from the Galapagos without naming a *type* locality, I shall restrict the name *fusco-irroratus* to the Puán individuals, and call the two Galapagos species *S. trinesiotis* and *S. tetranesiotis*. This nomenclature would, of course, not hold in case the Puná specimens should turn out to be identical with any of the Galapagos races.

DIAGNOSIS OF *Sphingonotus* RACES.

The following are diagnostic descriptions of the races of *Sphingonotus*. Detailed descriptions follow on pages 439-447.

Sphingonotus trinesiotis chathamensis.—General color pale greenish clay-color. Genæ of same color as rest of head but paler; post-ocular and lateral prozonal stripes present; pale diverging stripes along angles of metazona, tegminal maculations confined to sloping surfaces of closed wings; no dark vertical stripe on hind femur; lower three fourths of hind tibia dusky.

From Chatham Island.

Sphingonotus trinesiotis indefatigabilensis.—A very distinct race. Genæ distinctly paler than rest of the head and of a slaty tone; post-ocular and lateral thoracic markings very distinct and strongly resembling those of *chathamensis*; pale diverging bands on angles of metanotum present as in the Chatham race but less distinct; a pale line along the angles of the closed tegmina; maculations of the tegmina confined to the sloping surfaces.

Resembles the Chatham race in the bands of the head and thorax, and the Albemarle race in the slaty coloration of the genæ.

From Indefatigable Island.

Sphingonotus trinesiotis albemarlensis.—Genæ distinctly differentiated from rest of head, being paler and having a slaty color; thoracic markings as in the other two *trinesiotic* forms, but less distinct; tegminal maculations forming complete cross-bands as in the Charles and Barrington races of *S. tetranesiotis*.

From Tagus Cove, Albemarle Island.

Sphingonotus tetranesiotis charlesensis.—Head and thorax pale rusty-brown, head paler than thorax, no bands on either; tegminal maculations form complete cross-bars; lower surface of hind femur with a dusky longitudinal band.

From Charles Island.

Sphingonotus tetranesiotis barringtonensis.—Very similar to the Charles form. Head and thorax uniform reddish-brown; tegminal maculations forming complete cross-bands; lower three fourths of

posterior tibiæ continuously dusky, differing thus from the Charles and agreeing with the Chatham and Hood forms.

From Barrington Island.

Sphingonotus tetranesiotes hoodensis.—Head and thorax uniform reddish-brown; tegminal maculations confined to lateral sloping surfaces; lower three fourths of hind tibia continuously dusky; a longitudinal dark band on lower surface of hind femur as in *charlesensis*.

Closely resembles the Charles race in all except the dusky color on hind tibia, agreeing thus with the Barrington form, but differs from the latter in the longitudinal dark band on lower surface of hind femur.

From Hood Island.

Sphingonotus tetranesiotes indefatigabilensis.—General coloration similar to that of the Charles form, but more reddish; maculations of tegmina not forming continuous cross-bands; no longitudinal band on ventral surface of metathoracic femur.

From Indefatigable Island.

RELATIONSHIPS OF THE *Sphingonotus* RACES.

The two species of *Sphingonotus*, as characterized above in their varieties, differ from each other as follows: the *trinesiotes* forms have pale longitudinal bands on the angles of the pronotum, and the genæ differ in color from the rest of the head; the *tetranesiotes* forms have no markings on either the head or the thorax, and the genæ are uniform in color with the rest of the head.

If we compare the distribution of the races of *Sphingonotus* with that of the Galapagos races of *Schistocerca*, little similarity will be found between the two cases. They agree only in this: that all the varieties in each genus can be referred to two species, and that one race of one species lives on Chatham Island and one race of the other on Charles. The characters of the varieties themselves give no evidence in either species, of any one's being the ancestor of the others. On the other hand, there is nothing to oppose the supposition that Chatham and Charles Islands were respectively the original homes of *S. trinesiotes* and *S. tetranesiotes*. It is easy to imagine how the races on the other islands might have descended from forms on Chatham and Charles similar to those now found there. The geologic and climatic characters of the various islands point to Chatham and Charles as being the oldest inhabitable parts of the archipelago. Hence, we may suppose that these two islands were the first to be populated by representatives of the genus. Here they could have become dif-

ferentiated into the two species. Finally, by migration to the other islands—from Chatham to Indefatigable and Albemarle, and from Charles to Hood, Barrington and Indefatigable, the various races could have been produced.

DETAILED DESCRIPTIONS.

SPHINGONOTUS TRINESIOTIS sp. nov.

Distribution.—Chatham, Indefatigable and Albemarle Islands.

The characters of its three varieties are as follows :

SPHINGONOTUS TRINESIOTIS CHATHAMENSIS var. nov.

From Chatham Island.

Description of the Type. Male.—Head pale clay-color, front clouded with minute dark punctations ; genæ paler than the other parts : a black post-ocular stripe, with a narrow, pale longitudinal line above it. Dorsal surface of prozona same color as top of head ; dorsal surface of the metazona dusky reddish-brown with a pale stripe on each side, continuous from the pale clay-color of the dorsum of the prozona, running outward and backward just within the angle of the lateral deflection of the metazona. Just below the lateral angle of the prozona, bordering the pallid dorsal area, a dusky stripe continuous with the post-ocular stripe of the head ; below this a pale area, and below it a wide reddish-brown band inclined obliquely from behind, forward and downward ; on the metazona this is continued less distinctly, with an inclination in the opposite direction, exactly as in *S. trinesiotis indefatigabilensis* ; the upper stripe continues more faintly upon the metazona, bordering the pale upper lateral stripes ; metazona between these two black stripes reddish-brown ; both prozona and metazona, below the lower stripe, pale. Sides of mesothorax and metathorax pale clay-color, clouded with dusky. Lower surface of the thorax uniform pale yellowish. Prothoracic and mesothoracic legs pale reddish-brown with a few dusky spots. Metathoracic femora very pallid, each crossed externally by two oblique black areas which do not quite reach the lower lateral outer carina, the latter with five small black spots ; posterior swelling of femur slightly more brownish than the rest ; on the inner surface the large spots well marked, the lower part of the first running forward as a wide band to the anterior end of the femur ; no ventral femoral stripe. Hind tibia black at the upper end, then surrounded by a short yellow band widest on the outer side, from this to the lower end continuously bluish-brown, darkest on the inner side ; spines yellow basally, black-tipped. First two joints of

hind tarsus clay-colored, the terminal one light green, the claws green, black-tipped. Tegmina darker than the rest of the body, the sides marked by two large dusky blotches confined to the lateral sloping surfaces; apical part with small dark brown quadrate spots. Abdomen uniform pale yellowish clay-colored. Length of tegmina 19 mm.

Variations (17 specimens).—Thirteen of the specimens have the stripes of head and thorax as described for the *type*, although they vary much in distinctness. Four are so uniformly pale-colored that they show only the faintest indications of the stripes. None of them show the slaty genæ of the Indefatigable and Albemarle specimens, although a pale coloration of the genæ is a common characteristic. In many the diverging lateral stripes of the dorsum of the metazona show plainly, but in others they are either wholly wanting or are present as mere suspicions. Two specimens have the longitudinal angles of the closed tegmina, pale clay-colored, forming two very conspicuous posteriorly converging stripes of the same color as the entire dorsal surface of the closed tegmina—a marking characteristic of *S. trinesiotis indefatigabilensis*. In only three specimens do the lateral blotches of the fore wings encroach on the dorsal surface of the wings, and in none do they form complete transverse tegminal bands. All the specimens have the hind tibiæ closed like those of the *type*, or on the same pattern, the bluish tinge being generally lacking and the color simply brown or dusky. The degree of coloration varies considerably, but the specimens differ uniformly from those of any other island in having the lower three fourths to four fifths of the tibiæ continuously dark-colored. In most of the specimens the spines are dusky basally, instead of yellowish as in the *type*. The green color of the third tarsal joint also is not a constant character, this segment being generally the color of the first and second segments.

Length of tegmina of *male*, 12, 12, 13, 12 = 12 mm.; of *female*, 18, 18, 17.5, 17, 17.5, 18, 19, 18, 18, 19, 17 = 18 mm.

The color pattern of the *type* is almost exactly that of *S. trinesiotis indefatigabilensis*, but the markings are less distinct. The pale supra-post-ocular stripes of the head are continuous across the prozona with the diverging stripes on the angles of the metazona. It shows most highly developed the pattern faintly indicated upon some of the Albemarle specimens. The Chatham race is certainly more closely related to the Indefatigable form than to any other, but it strongly resembles the Hood race in being of a uniform, pale, reddish-brown color and in having the lower part of the hind tibia dusky. On the

other hand *S. trinesiotis indefatigabilensis* and *S. trinesiotis albemarlensis* agree with each other and differ from all the others in having the genæ slate-colored. The Chatham specimens, however, very commonly have the genæ paler and more uniform in color than the rest of the head. It is readily conceivable that this race may once have had slate-colored genæ, and that, before this character was lost, the ancestors of the Indefatigable and Albemarle races left Chatham. The only Chatham nymph obtained is 16 mm. long and is marked in every way like the adults.

SPHINGONOTUS TRINESIOTIS INDEFATIGABILENSIS

var. nov.

From Indefatigable and Seymour Islands.

Description of the Type. Male.—Head dark gray above; front dusky, pale reddish-brown about the bases of the antennæ; genæ with a very pronounced slaty color; a distinct black post-ocular stripe extending from the eye backward and almost imperceptibly upward. Antennæ colored as with other races. Pronotum mixed dusky and reddish-brown; on upper part of the sides of the prozona a distinct black stripe continuous in front with the post-ocular stripe and faintly prolonged posteriorly to the reëntrant angle of the posterior margin of the metazona; below this a lighter colored area, which on the prozona is pale slaty, on the metazona reddish mottled with black; below this a second distinct black stripe, inclined obliquely downward and forward on the prozona, downward and backward on the metazona; below this stripe both prozona and metazona uniform, pale rusty. Sides of mesothorax and metathorax mottled with red, slate, brown and black. Thoracic sterna, as in the specimens from the other islands, uniform pale. Fore and middle legs reddish-brown, spotted with black. Hind femora with two dark blotches on the inner surface from the upper to the lower carinæ, situated as in the other forms; no prominent longitudinal dark line below; a small spot below, opposite the lower end of the posterior inner blotch, and on the left femur in front of this a very inconspicuous dark longitudinal line; outer surface also with two blotches, these opposite those on the inner surface. Femur otherwise pale, yellowish, clay-colored except terminal enlargement which is reddish-brown. Hind tibia dark at the upper end, below pale yellowish on the outer side, brownish on the inner side, except just below the upper black area when yellow; spines black-tipped, bases yellowish. Tarsal claws yellow, black-tipped. Abdomen above rusty-brown with the anterior parts of the terga

dusky, below pallid mottled with gray, black and rusty. Tegmina with the horizontal and sloping surfaces strongly differentiated and contrasted in color, the former pale brownish-clay-color with a small median basal area dark brown, the latter strongly infuscated, anteriorly the color specially condensed into two, large, dusky, brown spots reaching from the lower margin of the wing to the upper margin of the lateral sloping surface, excluded abruptly from the horizontal dorsal surface; posterior part of tegmina pale, immaculate; veins and reticulations dark brown. Length of tegmina 19 mm.

Variations (14 specimens).—In color these specimens are in some respects an intensified form of the Albemarle race. The slaty color of the genæ strongly characterizes all but four specially reddish specimens. There is a horizontal post-ocular stripe reaching from the eye to the prozona and two prozonal stripes present in all, although they vary considerably in intensity on different individuals. The metazona varies from light yellowish-brown to reddish-brown. The prozonal bands are sometimes continuous upon the metazona and sometimes not. Whatever the color of the dorsal surface of the metazona is, the prozona is generally lighter in color and uniform with the head. There is almost no variation in the color of the metathoracic femora, the large black spots are generally well indicated, resembling those of the Albemarle form but are either discontinuous or but faintly indicated across the dorsal edge of each femur. The basal and middle blotches on the tegmina are in no case present on the upper horizontal surface of the closed wings. The plain pale color of this area contrasts strongly with the lateral surfaces, forming the most conspicuous character of the species, and one by which it is easily distinguishable in the field from the other species of the genus on the same island, with which it associates, viz., *S. tetranesiotes indefatigabilensis*.

The nymphs have the markings of head and thorax that are characteristic of the adults, the slaty genæ being prominent.

Length of tegmina of *male*, 14, 13, 13, 15 = 14 mm.; of *female*, 18, 19, 20, 19.5, 20, 18.5, 20, 20, 19.5, 18.5 = 19 mm.

This form is evidently more closely related to the Albemarle race than to either the Charles race or the other Indefatigable race. Although it differs from *Sphingonotus trinesiotes albemarlensis* in being somewhat larger, yet it resembles it and no other in the slaty color of the genæ, and the Albemarle race has faint indications of all the markings of the head and thorax of *S. trinesiotes indefatigabilensis*. The latter however differs distinctly from the former in the coloration of the tegmina.

SPHINGONOTUS TRINESIOTIS ALBEMARLENSIS

var. nov.

From Tagus Cove, Albemarle Island.

Description of the Type. Male.—General tone of coloration dull reddish-brown, everywhere more or less mottled or spotted with black. Top of head, frontal lunule, and frontal costa as far down as bases of antennæ, dusky, the frontal lunule mottled with orange; on each side of vertex a darker colored groove curving outward posteriorly; a narrow orange post-ocular stripe running backward and inward a little above the middle of the eye; genæ below this stripe pale slate-colored; clypeus and lower part of front spotted everywhere with black on a reddish-brown ground; labrum slaty, punctate with black. Antennæ dusky, each segment annulate with orange, this color especially prominent basally, the black predominant distally. Pronotum dusky on dorsal surface, above on each side an indistinct, orange stripe continuous in front with the narrower post-ocular stripe, posteriorly the two diverging to the outer posterior angles of the metazona; on the prozona below the orange stripe a wide black stripe on the lateral angle, next below this a narrower slate-colored stripe followed by a wider black stripe again; the rest of the prozona and the sides of the metazona reddish-brown with black mottlings and punctations. Sides of mesothorax and metathorax reddish-brown with small closely distributed black spots, making the general color dusky. Fore and middle legs reddish-brown, black spotted. Hind femora having a decidedly reddish tinge with a slaty tone along the outer side, each crossed above by two black bands reaching from the inner lower carina to the outer lower carina; on the outer side neither of these stripes is definitely outlined and each is obliquely inclined from above downward and forward; posterior enlargement of femur mottled with black giving it a dark appearance so that the femur appears marked with three transverse dusky areas. Hind tibia and tarsus yellowish, mottled with black, spines all black-tipped. Abdomen reddish-brown and slate mottled with black. Tegminal membranes pale transparent brown, color deepest basally, veins and reticulations dark brown; at about a third of the length of each tegmen from its base to the tip a large dusky blotch made up of numerous small fused spots; the blotches of the two tegmina meet above forming continuous cross-bands; half way between each of these spots and the tip of the tegmen a second small blotch confined to the side of the wing and of a brown color rather than black; beyond this numerous much smaller brown quadrate spots, and a few very small ones between the two large blotches. Posterior wings with

veins and reticulations all very dark-brown, membrane of anal half transparent with pink and green reflection, of humeral half rather strongly infuscated. Length of tegmina 17 mm.

Variations (13 specimens).—Many of the specimens are in general much paler than the *type*, and in the majority the stripes on the outer sides of the posterior legs are much less distinct. The maculation of the tegmina varies from brown to black. In nearly all cases the anterior black spots meet each other mesially, and in many the median spots also meet—in nearly all they approximate each other much more than in the *type*, or are connected by a lateral spreading of a condensation of the dorsal spots of the intervening area of the tegmina. Nine of the specimens have the slaty color of the genæ well marked as in the *type*, three of the others are everywhere very pale, while the fourth is unusually dark. The ventral surface of the thorax is in all the specimens pale, much paler than the lateral parts. The prozonal markings are best developed in the *type*; in the others the thorax is usually dull reddish-brown. In a few the small spots of the apical part of each tegmen are so crowded as to form a third dusky area half way between the median blotch and the tip of the wing.

Length of tegmina of *male*, 12, 12, 11, 11 = 11.5 mm.; of *female*, 15, 16, 16, 17, 17, 16, 17, 16, 15.5 = 16 mm.

SPHINGONOTUS TETRANESIOTIS sp. nov.

Distribution.—Charles, Hood, Barrington and Indefatigable Islands. The characters of its four varieties are as follows:

SPHINGONOTUS TETRANESIOTIS CHARLESENSIS

var. nov.

From Charles Island.

Description of the Type. Male.—Head almost uniform and pale without stripes, somewhat dusky above and on the front; genæ lacking the slaty color. Pronotum pale yellowish-brown; metazona dusky along posterior margin; no sign of stripes on the side of the prozona. Sides of mesothorax and metathorax yellowish-brown; sterna of the same segments much paler than sides, being a pallid gray. Hind femora pale brownish on outer side with no trace of black bands, a few dusky spots along upper and lower carinæ, floor of ventral groove between the inner and median lower carinæ black except posteriorly where it is the color of the outer surface of the femur; inner surface with a large black area occupying nearly the anterior half of the femur, and a second smaller one occupying the position of the median black blotch of the Albemarle specimens, both fused below with the

ventral black stripe. Hind tibia pale yellowish-brown, punctate with dusky-brown. Length of tegmina 17 mm.

Variations (38 specimens).—The Charles specimens differ but little in color from those from Tagus Cove, except that the genæ are invariably colored uniformly with the rest of the head, and the head and thorax wholly lack the stripes that are indistinctly present on some of the Albemarle specimens. The transverse bands of the hind femora are lacking but the outer surface of each is generally clouded more or less with black. The ventral femoral stripe is present on thirty-six specimens (the other two have lost both metathoracic legs). This character distinctly separates the Charles and Hood races from the others; a few of the Albemarle specimens have only a faint indication of this stripe. The maculation of the terminal part of the tegmina is in most of the specimens slight or obsolete; on the other hand the two large blotches are generally very distinct and in most cases form two complete cross bands.

Length of the tegmina of *male*, 13, 13, 13, 13, 13, 12, 13, 13, 13, 13, 13 = 13 mm.; of *female*, 18, 19, 20, 19, 18, 18, 18, 19, 19, 19, 19, 19, 20, 20, 20, 19, 18, 19, 19, 18, 19, 20, 19, 20, 18, 17, 19 = 19 mm.

These figures show that the Charles form is larger than that from Tagus Cove or Albemarle, and their larger size is apparent when they are seen in the field.

SPHINGONOTUS TETRANESIOTIS BARRINGTONENSIS var. nov.

From Barrington Island.

Description of the Type. Male.—Head and thorax uniform pale reddish-brown, no dark markings anywhere. First and middle legs of same color as the body, spotted with black. Outer surface of hind femur pallid with faint indications of dark cross bands, inner surface as in the other races, *i. e.*, with a large elongated black spot anteriorly and a smaller one back of the middle; no ventral stripe on the femur. Posterior tibia colored as in the Chatham and Hood races; second and third joints of the tarsus green. Tegmina brownish, with two complete cross bands; terminal maculations few. Length of tegmina 17 mm.

Variations (9 specimens).—The Barrington specimens differ from the Hood specimens in the paler tegmina on which the dark basal and median blotches form two well-defined cross bands. The specimens present only a small amount of variation. One has a post-ocular stripe on each side of the head; otherwise there is no indication of

any stripes on either the head or the thorax. The posterior tibiae are in all cases colored as in the *type*, agreeing in this respect with both the Chatham and the Hood races. In most of the specimens the hind femur has a more or less distinct dark ventral band. It runs forward a varying distance from the lower part of the posterior large spot on the inner surface. In this respect the specimens resemble those from Charles Island.

Length of tegmina of *male*, 13 mm.; of *female*, 18, 17.5, 17.5, 17, 17, 18, 15, 18 = 17 mm.

SPHINGONOTUS TETRANESIOTIS HOODENSIS var. nov.

From Hood Island.

Description of the Type. Male.—General coloration very uniform reddish-brown, head and thorax scarcely differentiated in color, dorsal part of metazona a little darker than the other parts. Fore and middle legs almost uniform, spots indistinct. Hind femur pale externally with a few small scattered spots and a row of spots along the lower outer carina; the interior surface with two black blotches of similar position as in the other forms, the anterior elongated, reaching the trochanter; terminal swelling dusky on inner side; a dusky line along the floor of the ventral groove between the inner lateral and ventral median carinae. Posterior tibia and tarsus colored exactly as in the Chatham *type*. Tegmina same color as body; large blotches reduced in size and generally indistinct; smaller quadrate maculations very small and scattered. Abdomen slaty, mottled with dusky; the terga bordered posteriorly with orange. Length of tegmina, 20 mm.

Variations (10 specimens).—In color the specimens from Hood Island are very dark dull reddish-brown, resembling in this respect *S. tetranesiotes indefatigabilensis*, and have all the markings reduced to a minimum, the whole body being nearly uniform. The genae are colored the same as the rest of the head. Some show the very faintest indications of stripes on the thorax and head, forming the same pattern as in *S. trinesiotes*. Three of them lack the posterior orange borders of the abdominal terga described for the *type*. They all agree with the *type*, however, in the coloration of the hind tibia and many have the terminal joint of the tarsus greenish. The continuous infuscation of the lower two thirds of the hind tibia is a character possessed by the *trinesiotic* Chatham race, and by the *tetranesiotic* Hood and Barrington races, but not by any of the others. This character might, therefore, be taken as evidence of a relationship between these three. However, the general resemblance of the Hood and Barrington forms

to the Charles form, and their otherwise dissimilarity to the Chatham form, is probably of more importance than the single character of the color of the hind tibia. All of the Hood specimens have the dark ventral femoral stripe as in the *type*, a character shared only with the Charles race.

Length of tegmina of *male*, 14, 15, 14 = 14.3 mm.; of *female*, 20, 19, 18, 18, 17, 19 = 18.5 mm.

SPHINGONOTUS TETRANESIOTIS INDEFATIGABIL-
ENSIS var. nov.

From Indefatigable and Seymour Islands.

Description of the Type. Male.—Differs from the Charles *type* as follows: general tone of coloration reddish, no dusky on the head except at lower border of the front. Basal parts of the tegmina with a strong reddish tinge, the lateral blotches confined to the sloping lateral surfaces of the closed tegmina, leaving the dorsal flat area plain except for a few maculations posteriorly between the posterior lateral blotches. No dark line on the ventral surface of the femur.

Length of tegmina, 18 mm.

Variations (23 specimens).—These specimens differ conspicuously as a group from those of either Albemarle or Charles islands in having in general a much more ruddy tone of coloring. They also lack, almost entirely, the ventral black femoral stripe, some having, however, a very faint indication of it.

Length of tegmina, of *male*, 13, 14, 14.5, 12.5, 14, 14, 13, 12.5 = 13.4 mm.; of *female*, 20, 18, 20, 20, 19, 20, 19, 19, 19, 20, 19, 18, 19, 20, 19 = 19 mm.

These figures show that there is no difference in size between the Charles race and this variety. The two forms are certainly closely related especially in the uniform coloration of the head and thorax, while the hind femora almost duplicate each other in the two cases, except for the ventral stripe present on the Charles form but absent in the other. Another very well-marked distinction, although not quite so constant, is the separation, along the median line, of the black blotches of the tegmina; in only three specimens do they form complete cross bands.

Genus *Halmenus*.

GENERAL REMARKS.

Halmenus SCUDDER, Bull. Mus. Comp. Zool., xxv, p. 17, 1893.

Type *Halmenus robustus* (Indefatigable and James Islands, Galapagos).

This genus has heretofore been reported only from Indefatigable

and James Islands. It occurs, however, also on Wenman, Charles and Albemarle. Each of the last two islands adds a new species to the genus, and it is probable that a search at the proper season on the other islands would show that the genus is not limited to the five islands from which it is now known.

H. robustus was found abundant early in June on that part of Indefatigable adjoining the Seymour Islands. Only one specimen of *H. choristopterus* was obtained on Charles. On Albemarle, one specimen of *H. cuspidatus* was obtained in December at Iguana Cove, a very humid district. The other specimens were taken in June near the top of the high mountain inland from Tagus Cove. The species was found here only above 3,500 feet, but below the summit—4,000 feet. This region is wetter than the lower parts of the mountain, but it is arid compared with the Iguana Cove region, and much dryer than the summit of the mountain. Hence, the distribution of the species is somewhat curious. The Wenman specimen is interesting in being the only Orthopteran secured on the island. It was taken from the stomach of a mocking bird.

DETAILED DESCRIPTIONS.

HALMENUS ROBUSTUS Scudder.

Pezotettix vic. sp. BRUNER, Proc. U. S. Nat. Mus., XII, p. 193, 1889.

Halmenus robustus SCUDDER, Bull. Mus. Comp. Zoöl., XXV, No. 1, VII, p. 18, pl. 1, figs. 6 and 7, 1893.

From Indefatigable and James Islands.

Description of Eight Specimens.—Head and dorsum of pronotum brownish-yellow, the frontal costa in four specimens dotted above with fuscous along the lateral angles; in one the whole front, vertex and genæ are coarsely spotted with black, and there is much continuous dusky about the bases of the antennæ; a black longitudinal post-ocular stripe. Antennæ generally irregularly annulate with dusky on a yellow ground, the dark color sometimes occupying a whole segment and sometimes only a part of a segment, generally more prominent on the distal half where it tends to become continuous; two specimens have no dusky on the basal part of the antennæ; antennæ hence not concolorous as described by Scudder. Eyes dark brown. Upper part of the side of the prozona with a wide longitudinal black band, generally with a yellow longitudinal dash in it on the scutum; the prozona below this stripe either plain brownish-yellow or with black spots and mottlings. The specimen having the entire head spotted with black has also the entire dorsal surface of the pronotum mottled with the same color, and the sides below the lateral stripe spotted as is the head. The black band of the prozona in four

specimens continues unbroken across the metazona becoming, however, on the metazona oblique, extending downward as well as backward. On three specimens it is faintly marked as streaks and spots across the metazona, while on one it ends abruptly on the interior end of this sclerite. Six specimens have two round black spots on the dorsal surface of the pronotum on the suture between the prozona and the metazona. One has only one very small one and this only on the left side, and the spotted specimen has them obscured by the other dark markings. Five have a similar pair of spots on the middle of the dorsal surface of the præscutum. There is no "bright white broken and bent stripe" below the lateral black prozonal band, as described by Scudder, on any of the specimens although such a stripe is present on the Charles Island specimen. The tegmina vary considerably. In two specimens the dorsal surface has the same color as the dorsal surface of the pronotum—brownish-yellow—with small dusky blotches, and the lateral surface mottled black and brown. Five specimens have the dorsal surfaces brown and the lateral surfaces black or dusky-brown. The eighth has the dorsal surfaces yellowish-brown and the lateral surfaces blackish-brown. Fore and middle legs yellowish, spotted with black. Posterior femur with basal, premedian, postmedian and apical transverse black bands reaching over the dorsal surface from the lower inner carina to the lower outer carina, the lateral parts of the first three being inclined obliquely forward from above. The rest of the femur brownish-yellow, spotted with black; a row of small quadrate black spots along the lower outer carina. Tibia and tarsus yellowish, spotted with black, claws black, the tibial spines black-tipped. Most of the specimens have the abdomen brownish below, yellowish above, with the second to eighth terga inclusive having large black blotches on the sides. In one the general color of the abdomen is reddish-brown and the black spots meet above forming continuous black bands covering the anterior two thirds of each tergum. In another the whole abdomen is brownish, below darker and with a reddish tinge; all of the first segment and the lateral parts of the second to eighth segments are black.

MEASUREMENTS OF HALMENUS ROBUSTUS EXPRESSED IN
HALF MILLIMETERS.

| Sex. | Male. | | Female. | | | | | | | Average. | |
|-----------------|-------|-----|---------|-----|----|----|----|-----|--|----------|---------|
| | | | | | | | | | | Male. | Female. |
| Length of body. | 55 | 56 | 70 | 71 | 69 | 61 | 58 | 55 | | 55.5 | 64 |
| “ tegmina. | 15 | 14 | 21 | 18 | 17 | 15 | 15 | 13 | | 14.5 | 16.5 |
| “ prozona. | 7 | 7.5 | 10 | 9 | 8 | 8 | 8 | 8 | | 7.2 | 8.5 |
| “ metazona. | 5.5 | 5.5 | 7 | 6.5 | 7 | 6 | 6 | 5.5 | | 5.5 | 6.3 |

HALMENUS CHORISTOPTERUS sp. nov.

Distribution.—Charles Island.

Description of the Type. Female.—Differs very markedly in the following structural characters from all of the Indefatigable specimens of *H. robustus*. Tegmina relatively very small and widely separated, reaching only slightly beyond the second abdominal tergum; their posterior ends rounded, lateral margins symmetrical. Pronotum strongly carinate mesially and latero-dorsally, lateral ridges not so sharp as the median.

General color yellowish-reddish-brown, much darker than in *H. robustus*. Black prozonal band not continued upon the metazona; a yellowish-white stripe borders the black prozonal band inferiorly; the whole of the lateral lobes of the pronotum below this stripe rugose, mottled with reddish and yellowish-white. Tegmina brown bordered laterally with white. One specimen of *H. robustus* has the right tegmen bordered with pale brownish near the base. Abdomen brown with small black blotches along the sides of the terga. Black bands of the posterior femora but faintly indicated, almost obsolete on the outer sides.

The *type* is the only specimen obtained. Its measurements are: length of body 34; tegmina 4.8; prozona 4; metazona 3.5 mm.

HALMENUS CUSPIDATUS sp. nov.

Distribution.—Albemarle Island; Iguana Cove at sea level; Tagus Cove between 3,500 and 4,000 feet.

Description of the Type. Female.—Much resembles the Charles *type* of *H. choristopterus* but differs in its much smaller size and in much more acute angle which the front forms with the vertex, this latter character being very conspicuous, the angle being about 55 degrees, while in *H. robustus* and *H. choristopterus* it is about 75 degrees. Tegmina well separated along the median line, narrow, reaching little past the second abdominal tergum. Pronotum mesially carinate; lateral angles not quite so prominent as in the Charles *type*, much more so than in *H. robustus*.

Head dark reddish-brown; front dusky; a black post-ocular stripe narrowly and faintly margined above with yellow. Antennæ annulate with black and yellow basally, mostly dusky on the distal half. Dorsum of prozona same color as the head; a wide lateral black prozonal band as in other forms, below which a light yellow line, and below this, on both the prozona and the metazona to the lower margin of the pronotum, yellow punctate with brown and with a large black spot on

the scutum. Entire metazona, to the lower yellow band, color of head and dorsum of the prozona. Tegmina brown with very faintly pale outer margins. Hind tibia and abdomen the same as in the *type* of *H. choristopterus* except that the lateral abdominal blotches are slightly larger.

Length of body, 25 mm.

Variations (7 specimens).—All the specimens have a median dorsal carina on the pronotum, and all have a more or less prominent lateral angulation to the pronotum. They differ uniformly from the Charles and Indefatigable species in having the much more receding front as in the *type*.

In color they vary little from the *type*. Some have the general color a little lighter brownish, and two of the males lack the brighter upper yellow stripe just below the lateral black prozonal band. One has three very distinct oblique dark bands on both the outer and inner sides of the hind femora, but in none do they cross the dorsal surface of the femur. The tegmina of all agree with those of the *type*, except that two have the outer pale marginal bands very distinct.

MEASUREMENTS OF HALMENUS CUSPIDATUS EXPRESSED IN
HALF MILLIMETERS.

| Sex. | Male. | | Female. | | | | | | Average. | |
|-----------------|-------|-----|---------|-----|----|-----|-----|--|----------|---------|
| | | | | | | | | | Male. | Female. |
| Length of body. | 53 | 49 | 41 | 43 | 39 | 40 | 42 | | 51 | 41 |
| " tegmina. | 10.5 | 8 | 8 | 9 | 5 | 7 | 10 | | 9.2 | 8 |
| " prozona. | 6.5 | 7 | 5.5 | 5.5 | 5 | 5.5 | 5.5 | | 6.75 | 5.4 |
| " metazona. | 5 | 4.5 | 4.5 | 4 | 4 | 4 | 4 | | 4.75 | 4 |

HALMENUS sp.?

From Wenman Island.

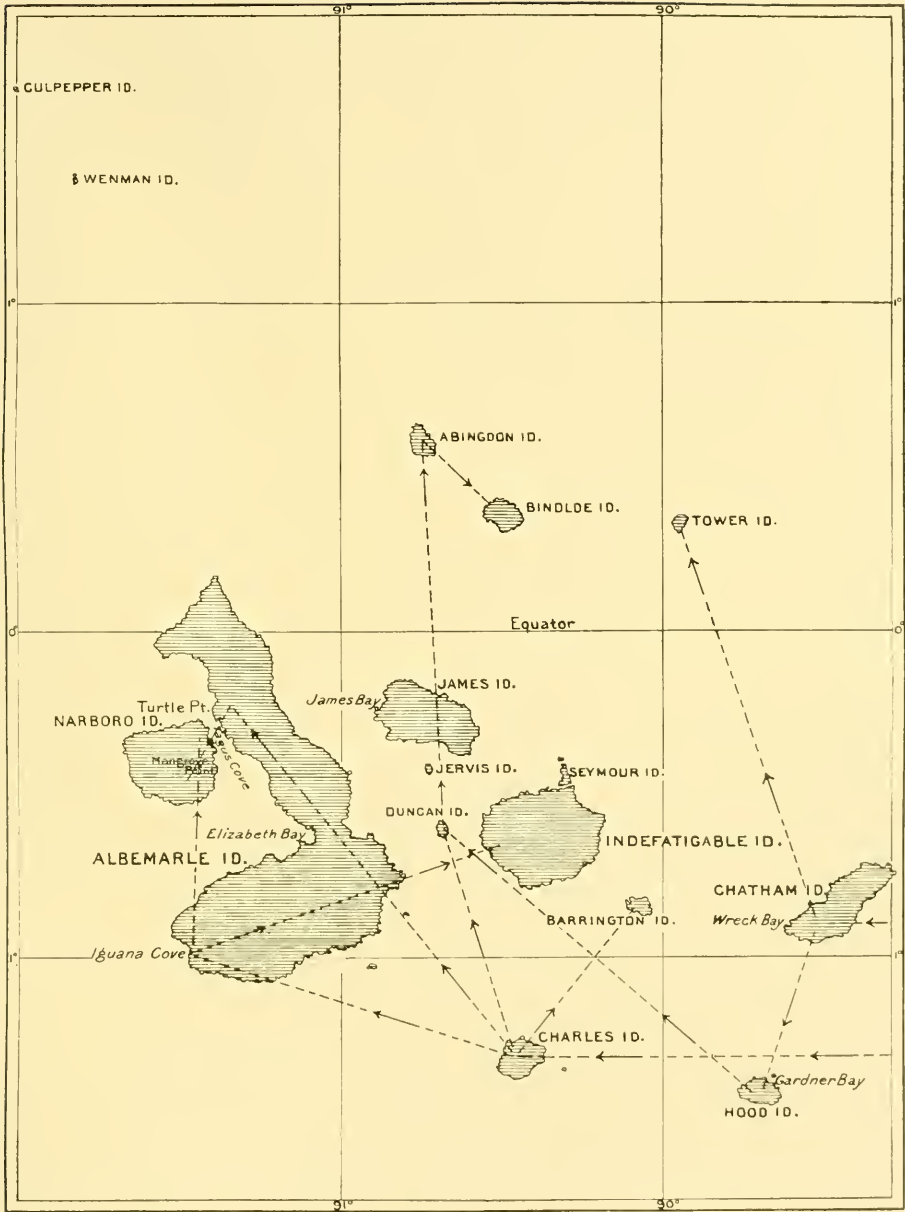
Very similar to *H. choristopterus* of Charles. Wings separated even more widely than in this species, each somewhat narrowed at the base and expanded distally. Colors not well preserved, but apparently the same as in *H. choristopterus*, except that the tegmina do not have white outer margins.

One mutilated specimen taken from the stomach of a Wenman mocking bird. The *Halmenus* must have been captured by the bird on this island, for this mocking bird is peculiar to Wenman and the far distant Barrington Island. It is not probable that the birds go back and forth between these two islands, crossing other islands that have peculiar species.

PLATE XXVI.

Diagrammatic illustration of apparent relationships of varieties of *Schistocerca* on the Galapagos Islands.

(452)



RELATIONSHIPS OF THE VARIETIES OF SHISTOCERCA IN THE GALAPAGOS ISLANDS.

PLATE XXVII.

Varieties of *Schistocerca* on the Galapagos Islands.

Natural size. Drawn by Miss Mary H. Wellman.

- FIG. 1. *Schistocerca melanocera*, female. Charles Island.
2. " *intermedia borealis*, female. Abingdon Island.
3. " *intermedia*, female. Duncan Island.
4. " *literosa discoidalis*, female. Chatham Island.
5. " *melanocera lineata*, female. Iguana Cove, Albemarle
Island.
6. " *melanocera immaculata*, male. Indefatigable Island.



M. H. WELLMAN DEL.

MANZ ENG. CO.

VARIETIES OF SHISTOCERCA ON THE GALAPAGOS ISLANDS.

INDEX

NOTE.—New species and varieties in **blackface** type, synonyms in *italics*.

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|---|--|
| <p><i>Acridium literosum</i> 425 <i>melanoceram</i> 419 Halmenus 447, 451 <i>choristopterus</i> 450 <i>cuspidatus</i> 450 <i>robustus</i> 412, 447, 448 <i>Pezotettix</i> 448 Schistocerca 412 <i>intermedia</i> 431 <i>intermedia borealis</i> 414, 435 <i>intermedia intermedia</i> 414 <i>literosa</i> 412, 415, 425 <i>literosa discoidalis</i> 414, 425 <i>literosa hyalina</i> 414, 427 <i>literosa punctata</i> 414, 428 <i>melanocera</i> 412, 415, 419, 423, 424, 425 <i>melanocera immaculata</i> 414, 423</p> | <p> <i>melanocera lineata</i> 413, 423 <i>melanocera melanocera</i> 413 <i>melanocera minor</i> 413, 421 <i>melanocera pallida</i> 413, 422 Sphingonotus 436 <i>fusco-irroratus</i> 411, 437 <i>tetranesiotis</i> 437, 438, 444 <i>tetranesiotis barringtonensis</i> 437, 445 <i>tetranesiotis charlesensis</i> 437, 444 <i>tetranesiotis hoodensis</i> 438, 446 <i>tetranesiotis indefatigabilensis</i> 438, 447 <i>trinesiotis</i> 437, 438, 439 <i>trinesiotis albemarlensis</i> 437, 443 <i>trinesiotis chathamensis</i> 437, 439 <i>trinesiotis indefatigabilensis</i> 437, 441</p> |
|---|--|

PROCEEDINGS
OF THE
WASHINGTON ACADEMY OF SCIENCES

VOL. IV, PP. 457-499. [PLATES XXVIII-XXXI.] SEPTEMBER 30, 1902.

PAPERS FROM THE HOPKINS STANFORD
GALAPAGOS EXPEDITION, 1898-1899.

X.

ENTOMOLOGICAL RESULTS (8).

MALLOPHAGA FROM BIRDS.

BY VERNON L. KELLOGG AND SHINKAI I. KUWANA.

STANFORD UNIVERSITY, CAL.

CONTENTS.

| | |
|--|-----|
| Introduction | 457 |
| Systematic account | 460 |
| List of hosts with parasites | 489 |
| Index | 499 |

INTRODUCTION.

THE first collection ever made of the parasitic insects Mallophaga (biting lice) found on the birds of the Galapagos Islands is that made by Mr. Snodgrass in 1898-1899 and here reported on. The collection includes specimens from 183 birds and represents 34 out of the 79 species of birds. Parasites were taken from 26 of the 48 bird species and all of the five bird genera peculiar to the Galapagos. This enumeration of bird species is based on the work of Rothschild and Hertert.¹ To their list Snodgrass and Heller have added at least three species. The last published list of Galapagos birds, prior to Roths-

¹ Novitates Zoologica, Vol. VI, pp. 85-205, August, 1899.

child and Hertert's is one by Ridgway,¹ whose list includes 105 species. Ridgway's longer list of species results from regarding as species some forms classed by Rothschild and Hertert as varieties. The whole number of species of Mallophaga in the collection is 43, of which 25 are new to science and are here first described. Of the 18 species determined to be identical with previously known forms, three are represented by specimens which differ so considerably from the types that they must be referred to as varieties. As most of the species to which the Galapagos Island forms can be referred have been previously described by the senior author from birds of North and Central America, the types were available for comparison and no doubts as to the determinations need be entertained.

It was hoped that the character of the parasites found on the strictly Galapagos Island bird hosts might throw some light on the relationships of these birds to continental genera and species, but our knowledge of the distribution of the Mallophaga is yet far too meager to give much value to suggestions in such direction and especially as we have no data at all regarding the Mallophaga of birds from the west coast of South America, from which region the Galapagos Islands doubtless received most of their original fauna. Moreover, an extraordinary condition referred to in the next paragraph, attending the distribution of the parasites among the birds of the islands, made such an attempt even less profitable than it might otherwise have been.

When the authors first began the examination of these Mallophaga they were startled by the unusual eccentricity of the occurrence of the parasites on the various bird hosts. A species of Mallophaga, obviously normal in such a strictly land bird as *Geospiza* would be found to occur occasionally on such strictly maritime birds as terns. For example, *Nirmus vulgatus*, a typical parasite of passerine birds, and heretofore found only on them (twenty passerine hosts previously recorded by Kellogg) occurs abundantly on *Geospiza*, *Nesomimus* and *Camarhynchus* and was also found on *Sterna fuliginosa* (Clipperton Island). On the other hand a common *Nirmus* of *Sterna* and *Anous* (*Nirmus gloriosus*) and belonging to a group of *Nirmi*, the

¹ Proc. U. S. Nat. Museum, Vol. XIX, pp. 459-670, 1896.

nigropicti, abundant on terns and gulls and normally peculiar to these ocean birds was taken also on *Geospiza*, *Camarhynchus*, *Nesomimus* and *Progne*. The first cases of this kind met with in working over the collection were attributed to mistakes in the collectors' records, or to straggling after death when the birds' bodies were in occasional contact in the game bag or on the skinning table. But the repeated occurrence of these extraordinary conditions and the testimony of the collectors soon revealed the true cause of this unusual distribution. We have to do with an abnormal phase of normal straggling! On the rocks of the islands maritime and land birds sit closely huddled, actual contact of the bodies often occurring. Migration is easily effected, and thus a parasite species (*Colpocephalum unciferum* Keel) normally peculiar to pelicans finds its way to a warbler (or honeycreeper), *Certhidea*. Thus are explained the large number of unusual and startling instances in the host distribution of the Galapagos Island Mallophaga.

Certain facts of interest connected with the parasites found on the bird genera peculiar to the archipelago, should be touched on. *Geospiza fuliginosa* has a total of twenty Mallophagous species credited to it, the largest recorded list of Mallophaga from any bird species. Four or more parasitic species are recorded from each of 18 of the 34 bird species from which Mallophaga were taken; a condition unique in the records of collections of Mallophaga. This condition, of abundant parasitism, is, of course, also due to the unusual facility of migration (or normal straggling) afforded by the forced gregarious habits of the islands' birds. A fair number of the bird species peculiar to the archipelago are infested by parasitic species not hitherto known, and thus will lend a special interest to any collections of Mallophaga which may be made from birds of the west coast of South and Central America, the region from which the bird fauna of the islands has been derived. It is of interest to note the marked commonness of parasitic species to the genera *Geospiza* and *Camarhynchus*, thus lending weight to the belief in their very near relationship. However there is at present, as already said, little of real value to be got from such speculation. A considerable number of the species in this collection

are confined to hosts which are peculiar to the islands ; but as so much opportunity for miscellaneous migration is offered, these forms cannot be advantageously compared with other species whose individuals may have actually recorded a wider host range but are also normally peculiar to strictly Galapagos hosts.

A second collection of Mallophaga from Galapagos Islands birds is now being made by Mr. Beck and with this additional material, and with collections from the west coast of South and Central America in hand it may be that some generalizations of importance may be arrived at.

The names of the birds used in this paper are those adopted by Ridgway¹ because these names were used by Snodgrass and Heller in determining the birds.

The papers by Kellogg on North American Mallophaga which are constantly referred to by abbreviated titles in the following pages are the following :

New Mallophaga, I; Contributions to Biology from the Hopkins Seaside Laboratory of the Leland Stanford Junior University, No. iv, 1896.

New Mallophaga, II; Contributions to Biology from the Hopkins Seaside Laboratory of the Leland Stanford Junior University, No. vii, 1896.

New Mallophaga, III; Contributions to Biology from the Hopkins Seaside Laboratory of the Leland Stanford Junior University, No. xix, 1899.

A List of the Biting Lice (Mallophaga) taken from Birds and Mammals of North America, Proc. U. S. Nat. Mus., Vol. XXII, pp. 39-100, 1899.

The authors have to express their obligations to Professor Walter Miller, of Stanford University, for assistance in composing the specific names, and to Miss Mary Wellman, artist.

SYSTEMATIC ACCOUNT.

Genus *Docophorus*.

DOCOPHORUS VALIDUS MINOR var. nov.

KELLOGG AND CHAPMAN, New Mallophaga, III, p. 56, pl. v, fig. 2, 1899.—
KELLOGG, List of Mallophaga, p. 44, 1899.

Four specimens, male and female, from *Puffinus subalaris* from

¹ Proc. U. S. Nat. Museum, Vol. xix, pp. 459-670, 1896.

Narboro, and one male and one female from *Nesomimus carringtoni* from Barrington.

All these agree well in shape, marking, and other characters with the type specimens of *D. validus* from *Puffinus gavia* from Monterey Bay, California, but are uniformly smaller, being about two thirds the size of the type-specimens.

DOCOPHORUS PLATYCEPHALUS sp. nov.

(Pl. xxviii, fig. 1.)

Three specimens, two male and one female, from *Oceanites gracilis* from Albemarle, and a female from *Geospiza fuliginosa* from same island. Differs from *D. thalassidromæ* Denny from *Thalassidroma* (*Oceanites*) *pelagica* in having the clypeus emarginate, the abdominal blotches brown instead of black and the blotches with semi-pustulations along posterior margin.

Male.—Body, length 1.25 mm., width .44 mm.; brown with dark brown lateral border; head wider than abdomen. Head, length .46 mm., width .43 mm.; very large in proportion to size of body; front with deep invagination; clypeus expanded laterally, rounded with two hairs on the front of the suture, a single hair arising from the dorsal surface near the obtuse anterior angle; two short hairs in front on the trabeculæ; trabeculæ as usual; antennæ large, segment 2 longest; eyes inconspicuous, with a long hair and a prickle; temporal margin with a hair and three prickles, occipital margin sinuous; color golden brown; signature shield shape; produced acuminate posterior angle not reaching the mandibles; antennal bands pale golden brown, indistinct posterior ends turning diagonally inward; occipital bands indistinct, weakly colored, very narrow dark border on the temporal and occipital margins. Prothorax short, broad with slightly diverging sides and rounded posterior angles, with one hair; with marginal lateral bands bending inward along posterior margin. Metathorax with sides rapidly diverging, which are slightly concave; posterior margin with rounding angle on the abdomen, and a series of about ten pustulated hairs arranged along each lateral half. Legs concolorous with thorax, with dark brown margins on femora and tibiæ. Abdomen elliptical, short, narrower than head; segments 2 to 8 with two to three long hairs on posterior angles; a single transverse series of pustulated hairs along dorsal margin; ground color yellowish-brown; dark lateral bands, wide, tapering posteriorly, a transverse dark line along posterior margin of each segment; posterior margin of last segment flatly rounded, with a few longish hairs.

Female.—Body, length 1.55 mm., width .58 mm.; head, length .51 mm., width .5 mm.; abdomen, elongate ovate; segments 1 to 7 with elongate narrow, dark brown triangles, with acute apex inward; each segment with several pustulated hairs along the posterior margin of the triangle; segment 8 wholly colored, segment 9 paler than 8 but wholly colored; posterior end usually emarginated.

DOCOPHORUS MELANOCEPHALUS Burmeister.

BURMEISTER, Hand. b. d. Ent., 11, p. 426, 1839.—KELLOGG, List of Mallophaga, p. 44, 1899.

Two specimens, male and female, from *Sterna fuliginosa* from Clipperton Island, a female from *Anous galapagensis* from Narboro, and a male from *Nesomimus macdonaldi* from Gardner. This is the common parasite of terns. The female specimen from *Anous* varies in having the transverse blotch of the first abdominal segment not continuous across the segment but divided into two lateral blotches.

DOCOPHORUS ICTERODES Nitzsch.

NITZSCH in Germar's Mag. f. Ent., vol. III, p. 290, 1818.—KELLOGG, List of Mallophaga, p. 45, 1899.

A single female from *Sterna fuliginosa* from Clipperton Island. This is the common parasite of ducks.

DOCOPHORUS PERISTICTUS sp. nov.

(Pl. xxviii, fig. 2.)

Numerous males and females from *Sterna fuliginosa* from Clipperton Island, one specimen from *Dendroica aureata* from Albemarle and a single specimen from *Nesomimus carringtoni* from Barrington. A well marked form with unusually short blunt head, and very heavy abdominal blotches.

Male.—Body, length 1.83 mm., width .91 mm.; dark chestnut brown, abdominal margin black. Head, length .61 mm., width .75 mm.; front slightly convex with a narrow uncolored border, and a short hair in each anterior angle; two short marginal hairs in front of the distinct suture; trabeculae small; eye inconspicuous, with two long hairs; temporal margins with three long hairs; occipital margin flatly convex, bare; signature shield-shaped, golden yellow, with acuminate posterior dark point, which does not reach the mandibles; antennae five-segmented, segment 2 longest, 3, 4 and 5 subequal; color pale brown, with a few hairs; angulated antennal bands, their continuations in front of the sutures as narrow marginal borders, the

diverging occipital bands and the narrow marginal temporal borders dark brown, and occipital margin black. Prothorax short, with slightly diverging sides, and flatly convex posterior margin; posterior angle with a single long hair, color dark brown, with dark lateral border, extending around the posterior angle, and a little way along the posterior margin. Metathorax short, broad, with widely diverging short sides, and broadly parabolic posterior margin, thickly set with a series of pustulated hairs. Sternal markings consisting of dark brown intercoxal lines, a pale median prothoracic blotch, and a small, pale, somewhat triangular metathoracic blotch. Legs short, stout, brownish, with narrow dark border. Abdomen broadly ovate; one to three long hairs in the posterior angles; whole abdomen chestnut brown, segments 1-7 with black lateral bands; segments with long, transverse, dark chestnut blotches separated medially by an uncolored line, widest on segment 5, narrowing on each successive segment; transverse blotches confluent medially on segment 1, with a small, medial, angulated, uncolored emargination on anterior margin; segments 1-6 with a series of pustulated hairs along posterior margin of each transverse blotch, and behind each series a narrow dark brown transversal line; segment 8, with transverse blotches confluent in middle; segment 9 dark brown with few short hairs in the posterior margin.

Female.—Body, length 2 mm., width .83 mm.; head, length .63 mm., width .76 mm.; last abdominal segment with usual emargination.

DOCOPHORUS LARI Denny.

DENNY, Monograph Anoplur. Brit., p. 89, pl. v, fig. 9, 1842.—KELLOGG, List of Mallophaga, p. 44, 1899.

From *Creagrus furcatus* from Culpepper. This is the common parasite of gulls, found on *Larus* and allied genera all over the world.

DOCOPHORUS BREVIFORMIS sp. nov.

(Pl. xxviii, fig. 3.)

Five specimens, male and female, from *Progne modesta* from Albemarle, 2 specimens from *Geospiza fortis* from Albemarle and one male from *Actitis macularia* from Albemarle. A member of the *excisus* group found on swallows and characterized by the emarginated clypeal front. This new form is especially broad and robust.

Male.—Body, length 1.26 mm., width .55 mm.; head and thorax golden brown, abdomen smoky golden brown. Head, length .53 mm., width .45 mm; front of clypeus deeply emarginated, a long

rather stout hair arising from the dorsal surface near the margin in each rounded latero-anterior angle of the clypeus, a short marginal hair behind it, another at the suture, two short hairs between suture and trabeculæ, and a single short marginal hair just in front of the trabeculæ; trabeculæ large; antennæ usual; eyes prominent, with a long hair; temporal margin rounded with three long hairs and one short hair behind the eye; occipital margin sinuous, with two short hairs; signature shield-shaped, anterior margin emarginated, posterior end projecting beyond the mandibles; antennal bands golden yellow, interrupted by the distinct clypeal suture; occipital bands distinct, diverging and meeting the expanded basal extremities of the antennal bands; a narrow black occipital border. Prothorax short, broad with slightly diverging sides, posterior angle with one hair; with marginal lateral bands bending inwards along posterior margin. Metathorax pentagonal, angled on abdomen, with a marginal series of eight pustulated hairs on each half of posterior margin; color golden brown, with a brown blotch in each lateral angle extending indistinctly along latero-anterior sides. Legs light brown, with narrow dark brown margins. Abdomen short, broadly ovate; segments with one to two long hairs in posterior angle; segments 1 to 4 with elongate, narrow brown triangles with acute apex inwardly; each one of segments 1 to 8 with several pustulated hairs along posterior margin of the triangle; segments 5 to 8 wholly colored; segments 5 to 7 with few pustulated hairs; segment 8 with unpustulated hairs; last segment subtransparent with rounded posterior margin. Genitalia slightly showing through segments.

Female.—Body, length 1.6 mm., width .73 mm.; head, length .55 mm., width .45 mm.; the lateral abdominal blotches much shorter, ninth segment emarginated for one half its length, the point being obtusely angled, and with a few hairs on each.

DOCOPHORUS COMMUNIS Nitzsch.

NITZSCH in Germar's Mag. f. Ent., vol. III, p. 290, 1818.—KELLOGG, List of Mallophaga, p. 50, 1899.

One female from *Geospiza fuliginosa* from Narboro, and one male from *Geospiza* species from Hood. It is surprising to find this elsewhere extremely widespread and abundant *Docophorus* of passerine birds so rare in the Galapagos Islands. The only host genus noted is one peculiar to the islands.

DOCOPHORUS GALAPAGENSIS sp. nov.

(Pl. xxviii, fig. 4.)

Numerous males from *Geospiza fuliginosa*, five specimens from

Albemarle, Chatham and Narboro; *Geospiza conirostris* from Hood, *Geospiza fortis* from Albemarle, two specimens from *Camarhynchus productus* from Albemarle; *Camarhynchus prothemalas* from Albemarle, and *Nesomimus parvulus* (Galapagos Islands). A very small *Docophorus* with Nirmoid markings and head characters, but the usual broad Docophoroid abdomen. It is to be noticed that, so far as this collection indicates, this parasite is confined to birds peculiar to the Galapagos Islands.

Male.—Body, length 1.6 mm., width .3 mm.; head pale, golden brown, abdomen very pale brown with dark brown margin. Head, length .4 mm., width .35 mm.; triangular, with narrow anteriorly tapering clypeus, which is truncate in front; one short hair on the anterior angles, and three along the front of the rather small trabeculæ; eye indistinct, with a short prickle, temporal margin weakly convex, with a long hair and several short prickles; occipital margin straight, with two prickles along each posterior angle; ground color of head pale golden brown with narrow dark brown antennal bands, well colored signature and narrow dark brown temporal margin. Prothorax small, with slightly rounded rectangular posterior angles, and straight posterior margin, with one long hair in posterior angle; brown lateral borders, which bend inward at posterior angle. Metathorax short, broad, angulated on abdomen, with eight hairs along each latero-posterior margin; brown lateral borders which bend inward along posterior angle. Legs concolorous with body, with margin pale brown. Abdomen ovate, stout, one third wider than head, with one to two hairs on posterior angles of segments; dorsal aspect of segments 4–7 with three groups of two hairs; lateral bands translucent dark brown, the segmental portions passing the sutures and projecting inward; slight indications of median transverse bands; last segment conspicuous, caudal end round; genitalia showing through body wall.

DOCOPHORUS ALBEMARLENSIS sp. nov.

(Pl. xxviii, fig. 5.)

Two specimens, male and female, from *Camarhynchus affinis* from Albemarle.

Male.—Body, length 1.61 mm., width .57 mm.; smoky golden brown with dark margins, head wider than abdomen. Head, length .63 mm., width .58 mm.; conical, with truncate or weakly convex front, three marginal hairs, one of which is behind the anterior lateral angle, a short marginal hair on the front of the trabeculæ; trabeculæ not reaching beyond middle of segment 2 of antennæ; antennæ with

segment 1 short and stout, segment 2 longest, and segments 3 to 5 short, subequal and colored pale brown; eyes prominent with a long hair; temporal margins rounded and bearing two long hairs and, on the occipital side of posterior angle, one prickle; occipital margin nearly straight, bare; general color of head dark brown; signature distinct; anterior margin concave, posterior angle extended backward, posterior margin extending in a long, acute angle beyond the mandibles; antennal bands distinct, dark chestnut brown, posterior ends turning diagonally inwards, anterior ends where interrupted by the suture turning in toward the base of the point of the signature; occipital bands dark brown, narrow, widely diverging, and separated from the antennal bands by a pale diagonal space; region immediately contiguous to the eye, darker. Prothorax short with slightly diverging sides and flatly convex posterior margin; posterior angle with a single hair; color smoky golden brown, with a dark brown lateral border bending inward along the posterior margin. Metathorax short, broad, with widely diverging short sides, and broadly parabolic posterior margin thickly set with a series of pustulated hairs; lateral margins with dark brown borders, which extend inward around posterior margin. Legs fuliginous with dark brown to black markings. Abdomen ovate; segments 3 to 8 with one or two longish hairs in posterior angles; whole abdomen except segment 9, strongly colored; segments 2 to 7 with broad black lateral bands; segments 1 to 8 with long transverse, smoky golden blotches, barely separated medially by an uncolored line; segment 8 with a narrow, curving, transversal, continued brown band, segments 9 wholly colored, but pale; segment 1 with one dim pustulated hair near mesal end of each transverse blotch in posterior margin; segments 2 to 4 with a series of pustulated hairs along posterior margin of each transverse blotch, segments 5 to 8 with unpustulated hairs; behind each series of hairs is a narrow dark brown transversal line; posterior margin of segment 9 with a few hairs. Genitalia extending through segments 3 to 9.

Female.—Length 1.9 mm., width .7 mm.; head, length .71 mm., width .68 mm.; transverse blotches on abdomen except on segment 1, not closely approached medially, segment 9 pale, slightly emarginate, with a few hairs; segments 5 to 7 with dim pustulated hairs.

DOCOPHORUS INSULICOLA sp. nov.

(Pl. xxviii, fig. 6.)

Two specimens, male and female, from *Certhidea albamarlei* from Albamarle; four specimens, one male and three female, from *Pyro-*

cephalus intercedens from Albemarle, and one female from *Geospiza fuliginosa* from ——— Island. A well marked form of unusual markings and shape, belonging to the *communis* group.

Male.—Body, length 1.3 mm., width .53 mm.; head golden brown, with dark brown marginal marking. Head, length .48 mm., width .43 mm.; front of clypeus angularly emarginated, a short hair rising from the dorsal surface near the margin in each rounded latero-anterior angle of the clypeus, a short marginal hair behind it, and three in front of the trabeculae; the trabeculae large, acutely pointed, reaching to base of segment 3 of antennae; antennae, if projected backward, reach almost to posterior margin of the head; eye prominent, with a longish hair; temporal margin convex, with two long hairs and two prickles, occipital margin sinuous; signature indistinct, with anterior margin emarginated, posterior point projecting beyond the mandibles; antennal bands pale brown, conspicuous, widely diverging occipital bands; occipital margin narrowly edged with black. Prothorax subquadrangular; rounded posterior angles with one hair; posterior margin flatly concave; color golden brown; distinct brown lateral borders which bend inward at posterior angle. Metathorax pentagonal, with three hairs in lateral angle and four hairs ranged along each latero-posterior margin; brown lateral border which bend inward at posterior margin. Legs pale brown, with tarsi brown. Abdomen short, obovate; segments 3 to 6 with one hair on the posterior angles, segments 7–8 with two hairs; a transverse series of 12–16 hairs along caudal margin of each segment; the whole colored golden brown except tip of segment 9; lateral bands dark brown, composed of a series of slightly diagonal, narrow, marginal blotches, one on each segment, each blotch widest anteriorly; on segments 1 to 5 lateral blotches extend inward; a narrow transverse line in the posterior margin of each segment; genitalia showing through the wall.

Female.—Body, length 1.4 mm., width .53 mm.; head, length .5 mm., width, .45 mm.; elongated narrow segments 1 to 7 with several pustulated hairs along posterior margin; segment 9 with posterior margin deeply notched, no hair.

Genus *Nirmus*.

NIRMUS GLORIOSUS sp. nov.

(Pl. XXIX, fig. 1.)

Many males and females from *Sterna fuliginosa*, three specimens from Clipperton; *Anous stolidus* from Clipperton; *Geospiza fuligi-*

nosa from Albemarle and South Seymour; *Camarhynchus affinis* from Albemarle; *Progne modesta* from Albemarle and *Nesomimus caringtoni* from Barrington.

A strikingly marked form showing some relation to the *nigripicti* group common on terns.

Male.—Body, length 1.9 mm., width .45 mm.; color pale with broad dark brown margin; medial blotches of abdomen dark brown. Head large and elongate, length .61 mm., width .41 mm.; elongate conical, with narrow, rounding clypeal front slightly emarginated, and five marginal hairs, one in the rounding, anterior angle, one just behind this, one at suture, and two before the trabeculæ; trabeculæ distinct, rather stout; antennæ short, not reaching the occipital margin when projected backward, segment 2 longest, segments 3, 4 and 5 subequal; last two segments colored; eyes prominent, with a longish hair and a prickle; temporal margins flatly rounded, with two long hairs and two prickles; occipital margin nearly straight; uncolored front of clypeus very narrow; signature large, shield-shaped, anterior region dark brown, posterior end not extended to the mandibles; antennal bands distinct, blackish-brown, interrupted by suture, the part behind the suture curving, with anterior extremity expanded; temples bordered with dark brown; ground color dark brown. Prothorax quadrangular, with posterior angles nearly rectangular, with one longish hair; lateral margin with strong dark brown even border, which bends inward on the posterior angle. Metathorax pentagonal, angulated on abdomen; lateral angles with five pustulated hairs; lateral margin with dark brown border. Legs pale brown with darkish-brown marginal blotches. Abdomen elongate elliptical, with posterior angle projecting and two or three longish hairs on dorsal surface; segments 1 to 2 with triangular medial blotch, segments 3 to 6 entirely brown, segments 7 to 8 pale, segments 1 to 8 with distinct narrow lateral black bands; posterior margin of last segment rounded with several pustulated hairs. Genitalia showing through segments.

Female.—Body, length 2.28 mm., width .51 mm.; head, length .68 mm. width .45 mm.; color pale with distinct dark brown margins, and distinct medial blotches which do not cover entire surface as in the case of male; last segment angularly emarginated without terminal hair.

NIRMUS OBTUSUS sp. nov.

(Pl. XXIX, fig. 2.)

A female from *Sterna fuliginosa* from Clipperton. Differs from *N. hebes* Kellogg on *Sterna maxima* from Monterey Bay, Califor-

nia, in having the head more elongate, less heavily marked, and in the absence of transverse abdominal blotches, and character of lateral markings.

Female.—Body, length 1.63 mm., width .43 mm.; slender, elongated; head and thorax with dark brown margin, and abdomen with narrow, dark brown lateral bands. Head, length .46 mm., width .31 mm.; conical, with clypeal front truncate or slightly convex; three marginal hairs, the first one near front, and the third in front of the suture, the second is midway between these; a short prickle and a marginal hair in front of trabeculæ; trabeculæ prominent, a little longer than segment 1 of antennæ; antennæ short, segment 2 longest, segments 3, 4 and 5 subequal; eye prominent, with one long hair and one prickle; temporal margin flatly convex with two long hairs and two prickles; occipital margin flatly concave with few prickles; signature distinct, shield-shaped, anterior margin convex, posterior margin produced in a narrow point; dark brown antennal bands interrupted by a distinct suture, the anterior extremities of the antennal bands bend broadly in at the suture; temporal borders narrow but well defined, broader below the eye, gradually narrowing posteriorly. Prothorax with sides slightly diverging; posterior angles rounding, with one hair; marginal borders dark brown, bending inward along posterior margin. Metathorax but little longer than prothorax, wider, and rapidly diverging lateral margins; posterior margin angulated; five pustulated hairs in posterior angles; dark brown lateral band and brown blotch projecting inward from postero-lateral margin. Legs concolorous with abdomen, with slightly colored margin. Abdomen elongate with convex sides, not parallel; segments 1 to 8 about equal length; segment 9 short, and with weak rounding emargination on posterior margin; four longish hairs on posterior margin of each segment; segments 3 to 8 with one or two longish hairs in posterior angles; a narrow lateral band in anterior part of each segment; segments 2 to 7 with small median blotches.

NIRMUS PALUDICOLA sp. nov.

(Pl. xxix, fig. 3.)

A female from *Butorides plumbeus* from Albemarle. A member of Piaget's group *nigropicti* whose members occur commonly on gulls and terns. This form most nearly resembles *N. punctatus*, but differs in the slightly concave clypeal front, in the transverse marking across the clypeus and in the character of the lateral abdominal blotches.

Female.—Body, length 2.16 mm., width .66 mm.; white, with black marginal markings, chestnut brown, median abdominal markings. Head, length .6 mm., width .5 mm.; conical, clypeus truncate or slightly concave in front, a short hair in each anterior angle and several other short hairs in the lateral margin between it and trabeculæ; temporal margin flatly rounding, with two longish hairs and two prickles, one of the prickles being between the hairs, and the other behind the last one; occipital margin straight, bare; trabeculæ small, but distinct; antennæ uncolored, except the tip of last segment which is pale brown; eyes conspicuous, with one long hair and one prickle; anterior part of clypeus transparent; margin of forehead with narrow interrupted black line, and an irregular blotch near extremity of head; temporal margins with narrow black lines extending behind the eyes. Prothorax quadrangular, posterior angle with a single long hair, an interrupted dark brown, wide, lateral border extending inward along posterior angles. Metathorax pentagonal; media of lateral margin with a black blotch; one prickle and a group of five long hairs in posterior angles. Legs concolorous with body, except tip of tarsæ and claws which are brown. Abdomen long, with segments 4 and 5 widest, a black lateral marginal blotch on each segment; segments 3 to 7 with two weak hairs on median posterior margin of each leg; small median blotches on segments 3 to 7; segment 9 emarginated, with a few terminal hairs; segments with 1 to 2 or 3 longish hairs on the posterior angles.

NIRMUS CURVILINEATUS sp. nov.

(Pl. xxix, fig. 4.)

A male from *Nesopelia galapagoensis* from Narboro and a female from *Oceanitis gracilis* from Albemarle. This is an extraordinary instance of distribution, and when coupled with the fact that the new species is of the *fuscus* group of *Nirmi*, species found almost exclusively on raptorial birds, simply balks explanation. The new form differs from the typical *fuscus* in having the transverse abdominal blotches continuous from side to side of abdomen, and the transverse series of pustulated hairs on each abdominal segment curving instead of straight.

Male.—Body, length 1.86 mm., width, .55 mm.; pale brown, with narrow distinct brown margin, the transverse abdominal blotches continuous from side to side of abdomen; abdomen narrow, head heavy and rounding. Head, length .53 mm., width .4 mm.; forehead broad, parabolic in front, with narrow brown border; four marginal hairs on

the rounded anterior angles, and two before the small but distinct trabeculæ; trabeculæ small, uncolored; antennæ long, segment 2 longest, segments 3, 4 and 5 slightly colored; eyes prominent, with one long hair; temporal margin flatly rounded with three long hairs and some few prickles; occipital margin slightly convex, bare; antennal bands brown, meeting in front and bending diagonally in posterior end; narrow blackish brown temporal margin, paling gradually inward from margin of head. Prothorax short, rectangular, with single long hair in posterior angles; brown lateral borders bent inward on posterior margin. Metathorax trapezoidal, posterior margin straight; four long pustulated hairs on each lateral third of the posterior margin, and a prickle in the posterior angle. Legs concolorous with thorax, with dark margin. Abdomen narrowest anteriorly, widening posteriorly to segment 5, segment 6 slightly narrow, segments 7, 8 and 9 short; posterior angles of each segment with one to two hairs and a single curving transverse series of long pustulated hairs on dorsum of each segment; each of segments 2 to 7 with a marginal dark brown blotch, widest posteriorly and projecting inward along the posterior margin of segment; golden brown, broad, transverse blotches entirely across all segments; posterior margin of last segment is rounded.

Female.—Body, length 2.2 mm., width .63 mm.; head, length .58 mm., width .43 mm.; last abdominal segment slightly emarginated with a few pustulated hairs.

NIRMUS GALAPAGENSIS sp. nov.

(Pl. xxix, fig. 5.)

Many males and females from 4 specimens of *Geospiza fuliginosa*, 3 from Albemarle and one from Chatham; *G. fortis* from Albemarle and Narboro; *G. conirostris* from Hood; *G. dubia* from Chatham; 2 specimens from *Nesomimus macdonaldi* from Hood; *N. parvulus* from Narboro; *N. carringtoni* from Barrington; *N. melanotis* from Wenman; 2 specimens from *Camarhynchus productus* from Albemarle; *C. variegatus* from Narboro; *Pyrocephalus intercedens* from Narboro; *P. dubius* from Chatham; *Certhiidea albemarli* from Albemarle; *Myiarchus magnirostris* from Albemarle; *Coccyzus melanocephalus* from Chatham; *Actitis macularia* from Albemarle, and *Procellaria tethys* from Albemarle.

Most like *N. simplex*¹ from *Merula migratoria* from Kansas, but distinctly different in size, in absence of the strong transverse blotches of abdomen, and in relatively broader abdomen.

¹ Kellogg, New Mallophaga, II, p. 492, pl. LXVII, fig. 2, 1896.

Male.—Body, length 1.28 mm., width .6 mm.; very pale yellowish-brown, with dark brown margin; docophoroid in shape. Head, length .38 mm., width .36 mm.; bluntly triangular, with narrow clypeal front very slightly concave; a single hair in anterior angles, and three others on lateral margins; trabeculae small, pointed; antennae as usual; eyes inconspicuous, with one prickle in posterior edge; temporal margins flatly convex, with a single long hair, and two prickles just in front of the hair; occipital margin straight, bare; signature indistinctly colored, broad, emarginated in front and truncated behind; antennal bands distinct and narrow; temporal margins for a little distance behind eyes, narrowly bordered. Prothorax short, broad, with lateral margins strongly converging anteriorly; a single longish hair in posterior angles; posterior margin flatly convex; brown lateral borders, which extend inward along posterior margin. Metathorax broad, short, obtusely angled on the abdomen, with a series of non-pustulated hairs along posterior margin; a lateral marginal blotch extending partly inward. Legs concolorless with body. Abdomen elliptical, short and broad for *Nirmus*, with one to two or three longish hairs in posterior angles of segments, and a single transverse series of four long weak hairs along posterior margin of each segment; dark, golden-brown lateral bands, and slight indication of median blotch.

Female.—Body, length 1.55 mm., width .58 mm.; head, length .43 mm., width .41 mm.; last abdominal segment slightly emarginate, without hair.

NIRMUS SEPARATUS sp. nov.

(Pl. xxix, fig. 6.)

Two females from *Camarhynchus variegatus* from Albemarle; a female from *Progne modesta* from Albemarle; a male from *Geospiza conirostris* from Hood; two females from *G. fortis* from Albemarle; a male from *Certhidea albemarli* from Albemarle; a female from *Anous stolidus* from Clipperton Island and two females from *Sterna fuliginosa* also from Clipperton Island. A distinctly marked form not closely like any previously described *Nirmus*.

Male.—Body, length 1.66 mm., width .38 mm.; distinguishable by its general dark color and rounding, uncolored clypeus; margins dark chestnut brown; narrow-waisted. Head, length .45 mm.; width .28 mm.; elongate conical, with slightly expanded uncolored part of rounding clypeus; a marginal hair on expanded clypeal portion, one at suture and two in front of the suture, one rising from dorsal surface and one from ventral; trabeculae small, but distinct; temporal margin

flatly convex, with one long hair and one short, and two prickles; occipital margin nearly straight; eyes prominent, flat, with one hair; antennae with segment 2 longest, segment 4 shortest, segments 4 and 5 are colored; signature shield-shaped, distinct; interrupted antenna-bands dark brown, distinct; temporal and occipital margins dark brown. Prothorax subquadrangular, sides slightly converging in front, with one short hair on the posterior angle; well defined dark brown marginal bands bent inward along posterior margin. Metal thorax with diverging sides and very flatly rounding posterior angles; five long hairs in posterior angles and two short weak hairs along posterior margin; lateral borders dark brown; a median long, spear-head-shaped sternal blotch of light brown showing through. Legs pale brown with dark brown margins. Abdomen elongate elliptical; posterior angles of segments except one with short hairs; each of segments 2 to 7 with a marginal dark band, widest anteriorly and projecting inward along the anterior margins of segment; all segments with a broad golden brown transverse blotch covering all of the segment; segments 3 to 7 with a series of pustulated hairs on posterior margin; posterior margin of segment 9 rounded, with a few long hairs.

Female.—Body, length 1.8 mm., width .38 mm.; head, length .48 mm., width .29 mm.; slightly darker than male; last abdominal segment usually emarginated, with a few weak hairs.

NIRMUS LEPIDUS sp. nov.

(Pl. XXIX, fig. 7.)

One male from *Geospiza fuliginosa* from Narboro; one female from *Nesomimus carringtoni* from Barrington and one male from *Sterna fuliginosa* from Clipperton Island. A well-marked form, resembling in general shape and head characters *Docophorus insolitus* from *Ptychoramphus alcuticus*¹ from Monterey Bay, California; but with Nirmoid, rather than Docophoroid, trabeculae. Both of these forms are at the line between *Docophorus* and *Nirmus* and in their combination of the characters of both genera make the generic distinction very uncertain. Among the *Nirmi* it resembles such forms as *N. opacus*² from *Aegialites semipalmatus*, Monterey Bay, California.

Male.—Body, length 1.38 mm., width .41 mm.; head and thorax light brown with strong dark bands, abdomen smoky golden-brown, with strong broad dark border; abdomen swelling in middle. Head,

¹ Kellogg, New Mallophaga, I, p. 94, pl. IV, fig. 5, 1896.

² Kellogg and Chapman, New Mallophaga, III, p. 83, pl. VI, fig. 6, 1899.

length .4 mm., width .31 mm.; elongate conical, with rounding front; one weak marginal hair near the front, three along front of suture and two behind, and one prickly in front of the trabeculæ; trabeculæ small but distinct, extending nearly to end of segment 1 of antennæ; antennæ short, segment 2 longest, segment 5 a little longer than segment 3, segments 4 and 5 colored; eyes flatly round, conspicuous, with one long hair and one prickly; temporal margins flatly convex with two long hairs and two prickles; occipital margin nearly straight, bare; signature distinct, broad, convex in front and truncate behind; antennal bands distinct, interrupted by suture; occipital bands narrow, extending to posterior rami of mandibles; temporal margins with narrow black borders, which are wider behind the eyes. Prothorax short, broad, with lateral margins slightly converging anteriorly, a single longish hair in posterior angles; posterior margin flatly convex; lateral borders extend inwards along the posterior margin. Metathorax broad, short, obtusely angled on the abdomen, with a series of pustulated hairs on lateral portions of posterior margin; a lateral marginal blotch extends inward. Legs concolorous with thorax, with dark marginal marking. Abdomen elliptical, one fifth wider than head; with one or two longish hairs in posterior angle of each segment, and a single transverse series of long hairs and a few weak hairs along posterior margin of each segment; dark lateral bands, and golden-brown transverse blotches entirely across all segments; genitalia extend beyond last abdominal segment.

Female.—Body, length 1.33 mm., width .45 mm.; head, length .41 mm., width .33 mm.; color, pale yellow with dark brown margin; last abdominal segment deeply emarginated, with a few short hairs.

NIRMUS VULGATUS Kellogg.

KELLOGG, New Mallophaga, II, p. 496, pl. LXVII, fig. 5, 1896.—KELLOGG, List of Mallophaga, p. 56, 1899.

One female from *Geospiza fuliginosa* from Albemarle. This specimen agrees well with the type specimens collected from California and Kansas birds.

NIRMUS VULGATUS GALAPAGENSIS var. nov.

Many males and females from *Geospiza fuliginosa*, 19 specimens from Albemarle, 5 from Narboro, 3 from Chatham, 1 from Hood; *G. fortis*, 3 specimens from Albemarle; *G. dubia*, 2 specimens from Chatham; *G. conirostris*, from Hood and Gardner; *G. intermedia* from Chatham; *Nesomimus macdonaldi* from Hood and Gardner; *N.*

parvulus from Narboro; *N. adamsii* from Chatham; *N. carringtoni*, 2 specimens from Barrington; *Camarhynchus productus*, 2 specimens from Narboro; *C. affinis* from Albemarle; *C. prothemelas* from Albemarle; *Certhidea albermarli* from Albemarle; *C. beckii* from Wenman; *Dendroica aureola* from Albemarle; *Myiarchus magnirostris* from Albemarle; *Pyrocephalus intercedens* from Albemarle; *Sterna fuliginosa* from Clipperton Island.

All these specimens agree in differing from the type specimens collected from numerous passerine bird species of California and Kansas, in the more pronounced character of the markings, the color of the markings being blackish instead of brown, and their outlines being much sharper. The transverse abdominal blotches are narrower and not interrupted by a median longitudinal uncolored line as in the type specimens, and the whole body of the Galapagos specimens is a little less slender and elongate than that of the American specimens; it is a more robust form.

NIRMUS INTERPOSITUS Kellogg.

KELLOGG, New Mallophaga, III, p. 23, pl. II, fig. 7, 1899.—KELLOGG, List of Mallophaga, p. 58, 1899.

Numerous males and females from *Geospiza fuliginosa* from Albemarle and Narboro; *G. fortis*, 2 specimens from Albemarle; *Nesomimus parvulus*, 2 specimens from Albemarle; *N. carringtoni* from Barrington; *Camarhynchus variegatus* from Albemarle. The type specimens were taken from *Dendroica viellotti* from Panama. No other records yet made.

Genus *Lipeurus*.

LIPEURUS LANGUIDUS sp. nov.

(Pl. XXIX, fig. 8.)

Numerous males and females from *Oceanites gracilis*, 5 specimens from Albemarle; from *Procellaria tethys* from Albemarle; from *Sula piscator* from Culpepper; from *Actitis macularia* from Albemarle; from *Pyrocephalus intercedens* from Albemarle; from *Nesomimus parvulus* from Albemarle; from *Geospiza fuliginosa* from Albemarle; from *Camarhynchus productus* from Albemarle. This new *Lipeurus* resembles Piaget's *angusticeps* and Kellogg's *diversus* but differs in markings of head and abdomen.

Male.—Body, length 3.34 mm., width .38 mm.; slender, parallel sides; body with distinct chestnut brown marginal markings. Head,

length .71 mm., width .31 mm.; elongate conical, with narrow long parabolic front; a weakly projecting very obtuse angle at suture; five marginal hairs of which two are in front of the angle, two behind and one in front of small trabeculæ; trabeculæ small but distinct; antennæ, segment 1 a little shorter than all the others combined, segment 2 next longest, 3 with dorsal angular projection at distal extremity, segment 5 slightly longer than 4; eyes prominent; temporal margin with a few prickles; occipital margin concave, bare; signature distinct, large, anterior margin very convex; color golden brown, interrupted antennal bands and temporal bands chestnut brown, distinct. Prothorax nearly square, with posterior margin slightly concave; golden brown with chestnut brown lateral borders which extend inward along posterior margins. Metathorax longer than broad, sides diverging slightly, posterior margin straight; two short hairs on posterior margin of dorsal aspect of the segment a long hair in each posterior angle. Legs concolorous with thorax, with narrow dark margin. Abdomen slender, subparallel-sided, with one, two or three weak hairs in posterior angles; segments 1 to 4 longest; segment 5 shorter than 6 or 7, segment 9 shortest and posterior margin emarginated, two short hairs on each half; segments wholly colored with narrow chestnut brown marginal bands.

Female.—Body, length 3.9 mm., width .5 mm.; head, length .77 mm., width .46 mm.; antennæ, segment 1 shorter than segment 2, segment 3, 4 and 5 subequal; abdominal segments 1 to 7 subequal in length, segments 8 and 9 shorter, segments wholly colored except last one which is with transparent posterior margin deeply, angularly emarginated.

LIPEURUS LIMITATUS Kellogg.

KELLOGG, New Mallophaga, 1, p. 124, pl. VIII, figs. 5 and 6, 1896.—

KELLOGG, List of Mallophaga, p. 60, 1899.

Three females from *Puffinus subalaris* from ———. Previously recorded from *Puffinus griseus*, *P. gavia*, *P. bulleri*, and *P. tenuirostris*, all from Monterey Bay, California.

LIPEURUS DIVERSUS Kellogg.

KELLOGG, New Mallophaga, 1, p. 123, pl. VIII, figs. 3 and 4, 1896.—

KELLOGG, List of Mallophaga, III, p. 59, 1899.

A few males and females from *Puffinus subalaris* from Narboro; *Anous galapagoensis* from Narboro, and *Butorides plumbeus* from Albemarle.

LIPEURUS DIVERSUS MAJOR var. nov.

A male and a female from *Puffinus subalaris* from Albemarle are distinctly larger than the other specimens, are more strongly marked, and the fifth abdominal segment of the male instead of being very short is as long as the fourth, a noticeable difference.

LIPEURUS GRACILICORNIS MAJOR Kellogg.

KELLOGG, New Mallophaga, III, p. 30, pl. III, fig. 3, 1899.

Males and females from *Fregata aquila* from Clarion Island; from an individual of same species taken off Cape St. Lucas, and from *Sterna fuliginosa* from Clipperton Island. Previously recorded from *Fregata aquila*.

LIPEURUS POTENS sp. nov.

(Pl. xxx, fig. 1.)

Males, females and young from *Sula piscator* from Culpepper; from *Anous stolidus* from Clipperton Island; from *Procellaria tethys* from Albemarle, and from *Sterna fuliginosa* from Clipperton Island.

Male.—Body, length, 4 mm., width .7 mm.; rather robust, parallel-sided, strongly marked with brown and black in regular blotches and bands, head broadly triangular and blunt. Head, length .83 mm., width .73 mm.; color golden brown; widest behind the eyes; margins of head in front of antennæ nearly straight; temporal margin feebly rounding; occipital margin weakly concave; clypeal suture distinct; clypeus round in front, with three hairs at each angle; at suture one long hair, and behind it two long hairs, farther back a single hair; signature large, transparent with rounded posterior end, front margin parallel with margin of clypeus; antennal segments uncolored except last one; segment 3 longest, segments 3, 4, 5 subequal, with a few hairs; trabeculæ small but distinct; eyes very prominent; temporal margin with four long hairs and a few very short spines; occipital margin without hair or spine; antennal bands distinct, dark brown; margin of head dark brown. Prothorax forming a parallelogram, wider than long, the angles weakly rounded; lateral margins dark brown, extending inward along the front and hind margins toward the middle, but not reaching it, leaving the middle third of the segment uncolored. Metathorax large, parallel-sided, much wider than long; posterior margin slightly concave, angles slightly rounded; near each

angle near the posterior margin is a single pustulated hair and a little further in are five long pustulated hairs grouped in a small, elliptical, uncolored space; ground color golden brown with margins dark brown. Legs strong, with elongate coxæ, very short thick tarsi with thick strong claws; margins dark brown; a few scattered hairs. Abdomen slender, subparallel-sided, with single hairs at posterior angles, longer on posterior segments; four hairs on posterior margin of segments 1 to 7, segments subequal, 7 and 8 tapering posteriorly; color mostly yellowish-brown, consisting of very dark lateral border and large transverse lateral blotches, those of segment 6 meeting at middle line, others not meeting; anterior and posterior margins of each segment narrowly uncolored; segment 9 deeply angularly emarginated and each posterior margin bearing many short hairs.

Female.—Body, length 3.25 mm., width .66 mm.; head, length .83 mm., width .7 mm.; antennæ with segment 1 short and stout, segment 2 longest, 3, 4 and 5 subequal, segments 4 and 5 colored; black lateral borders of abdomen wider than that in male; brown transverse blotches not meeting in the middle.

LIPEURUS BACULUS Nitzsch.

NITZSCH, Germar's Mag. Ent., III, p. 293, 1818.—KELLOGG, List of Mallophaga, p. 63, 1899.

One male from *Anous stolidus* from Clipperton Island, and one female each from *Geospiza fuliginosa* from Albemarle, from *Nesomimus melanotis* from Wenman, and from *Camarhynchus productus* from Albemarle. This remarkable distribution of this characteristic *Lipeurus* of the doves is not to be explained by straggling after death of host. The Clipperton Island specimen was taken in November, 1898, a month or more before the collectors reached the Galapagos Islands. Only terns or other maritime birds were taken on this little coral island. There is no dove resident on Clipperton Island. The dove *Nesopelia* peculiar to the Galapagos was found to be abundant on Albemarle and other of the larger islands. The only parasite taken from it however is *Nirmus curvilineatus* (see p. 490). *Lipeurus baculus* has been believed to be peculiar to doves, having been recorded from a dozen or more species. Piaget records finding females "égarrées" on a *Sula alba*, a *Totanus glottis* and a *Charadrius minor*. Our specimens from *Anous* and *Geospiza* are typical *baculus*, differing in no specific way from specimens found on the common domestic pigeon in the United States and agreeing entirely with the descriptions of this species by European authors.

LIPEURUS EXIGUUS sp. nov.

(Pl. xxx, fig. 2.)

One female from *Oceanites gracilis* from Albemarle and one female from *Geospiza fuliginosa* from Albemarle. This new species resembles *limitatus* Kell. more than any other *Lipeurus*, but it differs distinctly in the character of head.

Female.—Body, length 3 mm., width .36 mm.; slender, parallel-sided, pale with light yellowish-brown markings pale but well defined. Head, length .63 mm., width .3 mm.; elongate conical, with narrow almost pointed clear prolongation of clypeus in front, with lateral marginal hairs; trabeculae small; flatly rounding temporal margins with a few very small prickles; occipital margin concave, bare; eyes flat, not conspicuous; antennae with segment 2 longest, first nearly as long as segment 2, segments 3, 4 and 5 subequal, color paler than head; whole head pale yellowish-brown with dark brown marginal band on forehead; temporal margin near the eyes a feebler brown than the head color. Prothorax hexagonal with latero-anterior margins short and hardly distinct from lateral margins; lateral margin slightly darker than the last part of segment; short hair at posterior angle. Metathorax more than twice as long as prothorax; sides parallel, posterior margin straight, with four long hairs and one shorter one in posterior angles, the shorter hair being next to the outermost hair; color darker than rest of the segments. Legs concolorous with body, narrowly dark-edged. Abdomen slender elongate, subparallel-sided, widening slightly to segment 5, segments 6 to 10 tapering, segments 2 and 3 longest, segments 1, 4, 5, 6 and 7 subequal, segments 8, 9 and 10 shortest; segment 10 obtusely two-pointed, each segment with a short hair and bristle on margin just in front of posterior angle; each segment with a median pair of short hairs, a square pale brown blotch on each side of segments 1 to 8, dark-edged anteriorly and separated by a distinct median uncolored line; blotches of segment 8 meeting, and the marking of segment 9 continuous.

LIPEURUS HELLERI sp. nov.

(Pl. xxx, fig. 3.)

Males, females and young from *Sula piscator* from Culpepper, from *Anous stolidus* from Clipperton, from *Sterna fuliginosa* from Clipperton, from *Creagrus furcatus* from Culpepper and from *Geospiza fuliginosa* from Albemarle.

Male.—Body, length 2.93 mm., width .53 mm.; everywhere brown with margins narrowly dark; abdomen swelling in middle; head

short. Head, length .7 mm., width .49 mm.; conical, with slightly expanded parabolic front, numerous marginal hairs; temporal margin flatly convex with two longish hairs and two prickles; occipital margin concave, bare; trabeculae short but distinct; antennae with segment 1 as long as all others combined, second next longest, third short with a dorsal angular projection at dorsal extremity, fourth and fifth more colored than others; eyes large and conspicuous; signature broad and short, anterior margin convex, and posterior margin rounded; whole head chestnut brown; antennal bands interrupted by suture; with narrow dark temporal borders wide just behind eyes. Prothorax short, subrectangular, slightly wider posteriorly; lateral margin with dark borders which bend inward at posterior angle, one hair at posterior angle. Metathorax subquadrangular, posterior margin concave; lateral margins irregularly bordered with black; five very long hairs and one short hair on posterior angles, the short hair being outermost. Legs pale with dark brown marking. Abdomen elongate, with sides nearly parallel; segments 4 and 5 widest; segments 2 to 8 with one, two or three longish hairs on the posterior angles; two long and two short hairs at middle of each segment on posterior margin; all segments with complete transverse dark brown bands, black at lateral margins; segment 9 very small and emarginated.

Female.—Body, length 2.8 mm., width .83 mm.; head, length .76 mm., width .6 mm.; antennae, segment 1 longest, segment 4 shortest, segment 5 shorter than 3 and brownish in color; all segments with a few hairs; abdomen elongate-elliptical; segment 9 deeply angularly emarginated.

LIPEURUS MIRICEPS sp. nov.

(Pl. xxx, fig. 4.)

One male from *Geospiza fuliginosa* from Albemarle. This *Lipeurus* is more like *L. confidens* Kellogg, from *Diomedea nigripes* from Alaska, than like any other described form, but is smaller and distinctly different in markings. The specimen is probably a normal straggler on *Geospiza* from some maritime bird, perhaps an albatross, rather than the representative of a species peculiar to *Geospiza*.

Male.—Body, length 3.5 mm., width .83 mm.; elongate, whitish with sharply defined, black markings, the lateral abdominal bands consisting of segmental elongate blotches. Head, length .85 mm., width .31 mm.; not tapering, elongate with subparallel sides; front parabolic with clypeal margin uncolored; two marginal hairs in front of the suture, one in suture and one hair and two prickles behind

it; trabeculae apparently wanting; antennae with segment 1 longer than all others combined, segment 2 next longest, segment 3 short with a dorsal angular projection at distal extremity, segments 4 and 5 subequal; eyes flatly convex, inconspicuous, with one prickle; temporal margins convex with two prickles; occipital margin convex, bare; blackish-brown antennal bands interrupted by suture; black brown, round blotches behind eyes; two subtriangular blotches on occipital margin. Prothorax with sides peculiarly produced; with a long hair in the posterior angles; posterior margin flatly convex; dark brown blotches on latero-posterior margins. Metathorax with lateral margins concave; four hairs in posterior angles; posterior margin flatly concave; color whitish with dark brown lateral borders, widest in front half of middle and not reaching the posterior angle. Legs uncolored except for the chestnut tibiae and claws. Abdomen elongate, segment 4 widest, segments of about equal length; posterior angles with few weak, rather short hairs; color whitish with very narrow, clear lateral margin which sends expanded processes inward in behind half of the middle; lateral blackish blotches of segment 1 round, 2 to 6 elongate, while those of segments 7 and 8 are smaller and round; segments 8 and 9 narrow: segment 9 being narrow toward extremity with angular emargination, a few short hairs on each of the flint points.

Genus *Goniocotes*.

GONIOCOTES GALAPAGENSIS sp. nov.

(Pl. xxx, fig. 5.)

One male from *Camarhynchus productus* from Albemarle; two females from *Geospiza fuliginosa* from Narboro and one female from *Oceanites gracilis* from Albemarle. The species of *Goniocotes* are normally restricted to pheasants and doves, and the distribution of this new species as recorded is another one of the puzzles presented by this lot of specimens. There are no pheasants on the islands and only one dove, *Nesopelia*. No specimens of *Goniocotes* were taken from the numerous individuals of *Nesopelia* shot.

Male.—Body, length 1.08 mm., width .6 mm.; pale yellow, with chestnut brown marginal markings on head and thorax; abdomen with curving marginal blotches. Head, length .35 mm., width .48 mm.; front broad, convex, with short prickles; antennae in a narrow emargination with segment 2 longest, segment 5 longer than 3 or 4; eyes inconspicuous; temporal margin strongly angulated with two long

hairs and one prickle in posterior angle; occipital margin with two acuminate projections; color pale yellow with chestnut brown marginal frontal bands ending posteriorly on each side and extending inward diagonally in front of the antennæ; temporal margin with chestnut brown border; occipital margin with subsinuous chestnut brown border.

Prothorax very short and broad, trapezoidal with lateral margin flatly convex, and posterior margin nearly straight; posterior margin with a single hair, lateral border chestnut brown. Metathorax with blunt lateral angles, each with two long hairs; posterior margin nearly straight, with a series of four long hairs on posterior margin; chestnut brown marking on lateral margins. Legs concolorous with body. Abdomen broadly elliptical; posterior angles of segments bearing one to two weak hairs, posterior angles of segments 7 and 8 with two long hairs; dorsal surface with a few weak hairs; faint lateral border gradually becomes distinct toward anterior end which turns inward in anterior region of each segment; posterior margin of last segment flatly round, with several short hairs.

Female.—Body, length 1.4 mm., width .6 mm.; head, length .38 mm. width .56 mm.; elliptical with slight indication of lateral blotches.

Genus *Eurymetopus*.

EURYMETOPUS BREVIS Dufour.

DUFOUR, Am. Soc. France, IV, p. 674, pl. xxxi, fig. 3, 1835.—KELLOGG, List of Mallophaga, p. 64, 1899.

One male from *Arenaria interpres* from Narboro. This large and unmistakable species is peculiar to the albatrosses having hitherto been taken from *Diomedea exulans*, *D. albatrus*, *D. nigripes* and *D. brachyura* in various parts of the world. Specimens have also been recorded by Kellogg from *Fulmarus* and *Puffinus* from Monterey Bay, California. It is probably correct to regard as stragglers all specimens collected from any other birds than albatrosses.

Genus *Giebelia*.

GIEBELIA MIRABILIS Kellogg.

KELLOGG, New Mallophaga, I, p. 138, pl. XI, figs. 7 and 8, 1896.—KELLOGG, List of Mallophaga, p. 64, 1899.

Two females from a *Puffinus subalaris* from Albemarle. Previously recorded from *Puffinus griseus*, *P. gavia*, *P. creatopus*, *P. tenuirostris*, *P. bulleri*, and, as a straggler probably, from *Diomedea albatrus*; all the hosts from Monterey Bay, California.

Genus *Physostomum*.

PHYSOSTOMUM ANGULATUM Kellogg.

KELLOGG, New Mallophaga, II, p. 515, pl. LXX, fig. 5, 1896.—KELLOGG, List of Mallophaga, p. 69, 1899.

One female from *Myiarchus magnirostris* from Albemarle; also a young, probably this species, from *Dendroica aureola*. This *Physostomum* is unmistakably identical with the species *angulatum* described by Kellogg from *Tyrannus tyrannus* from Kansas.

Genus *Ancistrona*.

ANCISTRONA GIGAS Piaget.

PIAGET, Les Pediculines, Supplement, p. 117, pl. XII, fig. 8, 1885.—KELLOGG, List of Mallophaga, p. 71, 1899.

Two immature specimens from an undetermined host, the bird skin having been lost or thrown away before determination. Previously recorded by Kellogg from *Fulmarus glacialis glupischka* and *F. g. rodgersii*, and by Kellogg and Chapman from *Puffinus gavia* and *P. griseus*, all from Monterey Bay, California. Described by Piaget from *Procellaria glacialis*.

Genus *Colpocephalum*.

COLPOCEPHALUM MILLERI sp. nov.

(Pl. xxx, fig. 6.)

Numerous specimens, male and female, from several specimens of *Anous stolidus* from Clipperton Island; two females from *Butorides plumbeus* from Narboro; two females and a male from two specimens of *Camarhynchus affinis* from Albemarle; one male each from two specimens of *Geospiza fuliginosa* from Albemarle and a male from *Geospiza fortis* from Albemarle. A distinctly marked species like *C. maurum* N. described from terns, gulls, and other maritime birds.

Female.—Body, length 1.83 mm., width .68 mm.; elongate; golden brown with chestnut brown lateral margins, ocular blotches conspicuous. Head, length .35 mm., width .56 mm.; front broadly rounded with eleven hairs on each side between middle of front and ocular emargination; of those on the true front the first and fourth larger than the others and of those on the side one very long; ocular emargination deep, narrow; eyes undivided but with a faint medial emargination; ocular fringe prominent; of the hairs on temporal margin three are long; occipital margin flatly concave, bare; color golden brown with

chestnut brown occipital margin extending faintly over temporal margin; round yellowish-brown blotches one on each side of mandibles; small ocular black fleck continued with chestnut brown distinct ocular blotch. Prothorax hexagonal; sides with prickle and three long hairs, four long hairs on posterior margin. Metathorax with sides produced, posterior margin nearly straight or slightly convex; posterior angles with two short prickles; posterior margin with 5 or 6 long hairs on each side of median line. Legs pale yellowish-brown with several scattered hairs. Abdomen elongate, with long hairs in posterior angle of segments, and short spines along lateral margins; two more or less irregular series of hairs on dorsal surface of each segment; broad golden brown transverse blotches and narrow chestnut brown lateral bands; last abdominal segment parabolic with two hairs and a fringe of short sharp-pointed transparent hairs.

Male.—Body, length 1.68 mm., width .51 mm.; head .36 mm., width .53 mm.; golden brown; thorax and abdomen are darker than in female.

COLPOCEPHALUM SPINEUM Kellogg.

KELLOGG, New Mallophaga, III, p. 38, pl. IV, fig. 1, 1899.—KELLOGG, List of Mallophaga, p. 72, 1899.

Males and females from two specimens of *Anous stolidus* from Clipperton Island, and a female from *Geospiza fuliginosa* from Albemarle. The type specimens of this species were taken from *Fregata aquila* from Panama. The Galapagos specimens differ somewhat from the Panama specimens and probably ought to be called a variety.

COLPOCEPHALUM UNCIFERUM Kellogg.

KELLOGG, New Mallophaga, I, p. 140, pl. XII, figs. 1-3, 1896.—KELLOGG, List of Mallophaga, p. 72, 1899.

One female from *Certhidea albemarle* from Albemarle. Identical with the type specimens, which were described from *Pelecanus erythrorhynchus* from Lawrence, Kansas, and from *P. californicus* from Monterey Bay, California. At first glance this seems an inexplicable case of distribution, *Certhidea* being not only a land bird but a genus peculiar to the Galapagos Islands. The explanation lies in the presence of *Pelecanus californicus*, abundant on the islands. The pelican is the normal host of the parasite, but the migration to *Certhidea* has been effected by the crowding together of water and land birds on the rocks. This is a conspicuous example of the ready change to a host of very different character and habits, which is one of the features of the distribution of the Galapagos Mallophaga.

Genus **Menopon.****MENOPON SINGULARIS** sp. nov.

(Pl. xxxi, fig. 1.)

One female and an immature specimen from two individuals of *Anous stolidus* from Clipperton Island.

Female.—Body, length 1.76 mm., width .76 mm.; color, golden brown; abdomen with strong, dark brown transverse bands. Head, length .36 mm., width .65 mm.; front very obtusely but distinctly angled with three hairs on each side, then two prickles, then five hairs in front of the ocular region, of which three are long; palpi projecting slightly; antennæ not projecting beyond margin of head; temporal margin with four long hairs and many prickles; occipital margin concave with four long hairs. Color golden brown, darker medially, large black ocular fleck and dark chestnut brown ocular blotches, and a linear, black occipital border. Prothorax with produced antero-lateral angle, bearing one long hair and two prickles along rounded anterior margin and two long hairs and one prickle on posterior angle; posterior margin with four long hairs on each side of middle. Metathorax with divergent sides, narrower than head, with flatly convex posterior margin bearing a series of rather weak hairs, with dark brown transverse blotches along posterior margin. Legs pale brown with dark brown margins. Abdomen broadly ovate, with broad transverse bands across all segments; in the anterior angles of each transverse band of segments 2 to 8, a small curving comma-like chitinous band; the segments with fine hairs on lateral margin and a series of long hairs in the posterior margin; segment 9 with posterior margin flatly round, with a few short hairs and two long ones.

MENOPON NARBOROUGHII sp. nov.

(Pl. xxxi, fig. 2.)

One male from *Butorides plumbeus* from Narborq and one female from *Puffinus subalaris* from same island. This species differs from *M. paululum* and *M. petulans* in shape of prothorax and other characters.

Male.—Body, length 1.58 mm., width .7 mm.: pale golden brown, with golden brown transverse abdominal bands; broad and heavy. Head, length .35 mm., width .62 mm.; semilunar with flatly rounding front, shallow ocular emarginations, and rounded posterior angles; occipital margin flatly concave; a pair of marginal hairs in middle of front and others on sides; temporal margins with three long hairs and

few prickles, and one on occipital margin of the produced temples; four long hairs in occipital margin; a small, blackish-brown ocular fleck, chestnut brown ocular blotch; the mandibles black-tipped, the other mouth parts brown. Prothorax with produced lateral angles obtuse, bearing two prickles and one long hair; a series of ten long hairs in a rounding posterior margin; a narrow transverse line in front of the middle with four short bristles along the line. Metathorax with divergent sides, one eighth narrower than head, with nearly straight posterior margin, bearing a series of long hairs; in each lateral angle several small prickles and the terminal hair of posterior series; a transverse row of six short spines in front of middle of segment. Legs concolorous with head, with scattered rather long hairs. Abdomen broadly ovate, with a narrow transverse band across all segments except last one; in the anterior angles of each transverse band a rather large curving comma-like chitinous band; the segments with fine hairs on lateral margin, with one series of long hairs in each segment; segment 9 pale, posterior margin rounded.

Female.—Body, length 1.63 mm., width .86 mm.; head, length .31 mm., width .63 mm.; color paler than male; transverse bands of abdominal segments not distinct; posterior margin of last abdominal segment with fine hair fringe.

MENOPON SNODGRASSI sp. nov.

(Pl. xxxi, fig. 3.)

One female from *Coccyzus melanocoryphus* from Chatham.

Female.—Body, length 1.55 mm., width .8 mm.; being thus broad and short; golden yellow with broad, transverse, abdominal blotches and dark brown lateral border; head with distinct dark markings. Head, length .4 mm., width .63 mm.; broad and heavy, front broad, flatly rounded, with one short hair near the middle, then four short ones and then two longish ones, the hindmost one very short, being almost in the lateral angle just in front of the ocular emargination; palpi short, not reaching the margin; temples expanded, with three long hairs and three very long hairs; occipital margin concave, straight in the middle, with two long hairs, numerous prickles; large black ocular fleck; an irregular blackish-brown ocular blotch, which connects with the occipital margin by dark brown occipital bands. Prothorax; the part of the prothorax not concealed by the head is almost of the shape of a semicircle; three long hairs in each lateral angle; posterior margin without hairs; the transverse chitin bar distinct. Metathorax larger and wider than prothorax, but narrower than

abdomen; a long hair and two spines in each lateral posterior angle; posterior margin without hair or spine; regions of latero-posterior angles dark brown, the color extending forward narrowly along the lateral margin. Legs short, stout, concolorous with body. Abdomen golden brown, very broadly elliptical, with several spines on the lateral margins of segment, some long hairs in the posterior angles; a single transverse series of hairs along posterior margin of each segment; broad, transverse bands entirely covering each segment; marginal abdominal band very distinct; last segment rounded, with fringe of short hairs.

MENOPON GALAPAGENSIS sp. nov.

(Pl. XXXI, fig. 4.)

Two females from a *Geospiza conirostris* from Hood, and a female and two young from *Nesomimus macdonaldi* from same island. A well marked form most resembling in shape and markings of head *M. eurysternum* from woodpeckers, and *M. decoratum* from a white tailed kite, *Elanus leucurus* from Palo Alto, California.

Female.—Body, length 1.5 mm., width .78 mm.; pale yellowish with dark rusty brown marking; distinct broad transverse blotches on abdominal segments, the one on segment 2 especially strong. Head, length .38 mm., width .66 mm.; robust, almost twice as wide as long; front broad and flatly round, with several short weak hairs; two long hairs in front of the ocular emargination; temporal margin roundly expanded, with three long hairs and three very long ones and several short ones; occipital margin concave, with four long hairs; small black ocular fleck; an irregular dark chestnut brown ocular blotch, the two connected with the occipital margin; chestnut brown curving transverse band; ill-defined occipital bands, the bases of the bands being dark brown; on the forehead in front of the bands being two dark brown short curving bands on each side. Prothorax with posterior margin broadly and evenly rounded with 12 long hairs in a series extending from lateral angle to lateral angle; a narrow transverse line in front of the middle. Metathorax with diverging sides, straight posterior margin; along sides several short prickles; in the posterior angle are two large hairs, then a short prickle, and then a series of about eight long hairs along posterior margin. Legs concolorous with body, with dark margin. Abdomen broadly elliptical; posterior angle of each segment with two to three long hairs; a series of long hairs on the posterior margin of each segment; broad dark brown lateral bands, which are in interior angle of each segment, subtrans-

parent; pale brown transverse blotches across the segments; the crossed transverse blotch on segment 2 is specially strongly marked; posterior margin broadly parabolic, with few long hairs on posterior margin of each segment.

MENOPON ALBEMARLEI sp. nov.

(Pl. xxxi, fig. 5.)

One female from *Camarhynchus productus* from Albemarle and a young female from *Geospiza fuliginosa* from same island.

Female.—Body, length 1.89 mm., width .95 mm.; color pale brown, with brown transverse blotches and dark brown bands, prothorax large, and metathorax small. Head, length .37 mm., width .71 mm.; semilunar obtusely angled front, shallow ocular emarginations; front with a pair of long hairs, another on side followed by two prickles, then four long hairs in front of the ocular emargination; antennæ when outstretched projecting beyond the margin of the head by length of last segment; temporal margin round with five long hairs, of which two are very long, and a few prickles; occipital margin concave with four long hairs; a small fleck, dark brown ocular blotch and dark brown occipital margin; color pale brown. Prothorax very large, with produced lateral obtuse angles, bearing one prickle and one long hair, which is the terminal one in a series of fourteen hairs ranged along the rounded posterior margin of the segment. Metathorax small, hardly wider than prothorax, with diverging sides, straight or slightly convex posterior margin; along the sides a few short prickles, in the posterior angles with a long hair, then a prickle, and then a series of sixteen hairs ranged along the posterior margin. Legs pale, with longish scattered hairs. Abdomen ovate, with one long hair and several short ones rising along posterior angles, and a series of hairs along posterior margin; color pale brown, each segment with broad transverse subtriangular brown blotches and lateral bands.

MENOPON INCERTUM Kellogg.

KELLOGG, New Mallophaga, II, p. 533, pl. LXXIII, fig. 2, 1896.—KELLOGG, List of Mallophaga, p. 79, 1899.

Many specimens, males, females and immature, from *Geospiza fuliginosa* from Albemarle and Narboro, *G. conirostris* from Hood, *G. fortis* from Albemarle, *G. sp.* from Chatham, *Nesominus parvulus* from Narboro and Albemarle, *N. macdonaldi* from Chatham and Gardner, *N. carringtoni* from Barrington, *Certhidea albemarle* from Albemarle, *C. becki* from Wenman, *Camarhynchus productus* from

Albemarle, *C. salvini* from Chatham, *C. variegatus* from Chatham, *Progne modesta* from Albemarle, *Pyrocephalus intercedens* from Albemarle, *Actitis macularia* from Albemarle, *Oceanites gracilis* from Albemarle, *Procellaria tethys* from Albemarle, and *Anous stolidus* from Clipperton Island. Thus a parasite of wide range and of many host species.

Previously recorded by Kellogg from *Turdus ustulatus* and *Spinus tristis* from Palo Alto, California, and by Kellogg and Chapman from *Chondestes grammacus strigatus* from Ontario, California, and from *Thryothorus bewicki spilurus* from Palo Alto, California.

LIST OF HOSTS, WITH PARASITES.

Actitis macularia.—*Docophorus breviformis*, *Lipeurus languidus*, *Menopon incertum*, *Nirmus galapagensis*.

Anous stolidus (Clipperton Island).—*Colpocephalum milleri*, *C. spineum*, *Lipeurus baculus*, *L. diversus*, *L. helleri*, *L. potens*, *Menopon incertum*, *M. singularis*, *Nirmus gloriosus*, *N. separatus*.

Anous stolidus galapagensis.—*Docophorus melanocephalus*.

Arenaria interpres.—*Eurymetopus brevis*.

Butorides virescens.—*Colpocephalum milleri*, *Lipeurus diversus*, *Menopon narboroughi*, *Nirmus paludicola*.

Camarhynchus affinis.—*Colpocephalum milleri*, *Docophorus albemarlensis*, *Nirmus gloriosus*, *N. vulgatus galapagensis*.

Camarhynchus productus.—*Docophorus galapagensis*, *Goniocotes galapagensis*, *Lipeurus baculus*, *L. languidus*, *Menopon albemarleii*, *M. incertum*, *Nirmus galapagensis*, *N. vulgatus galapagensis*.

Camarhynchus prothemelas.—*Docophorus galapagensis*, *Nirmus vulgatus galapagensis*.

Camarhynchus salvini.—*Menopon incertum*.

Camarhynchus variegatus.—*Menopon incertum*, *Nirmus galapagensis*, *N. interpositus*, *N. separatus*.

Certhidea albemarleii.—*Colpocephalum unciferum*, *Docophorus insulicola*, *Menopon incertum*, *Nirmus galapagensis*, *N. separatus*, *N. vulgatus galapagensis*.

Certhidea beeki.—*Menopon incertum*, *Nirmus vulgatus galapagensis*.

Coccyzus melanocoryphus.—*Menopon snodgrassi*, *Nirmus galapagensis*.

Creagrus furcatus.—*Docophorus lari*, *Lipeurus helleri*.

Dendroica aureola.—*Docophorus peristictus*, *Nirmus vulgatus galapagensis*, *Physostomum angulatum*.

Fregata aquila.—*Lipeurus gracilicornis major*.

Geospiza conirostris.—*Docophorus galapagensis*, *Menopon galapagensis*, *M. incertum*, *Nirmus galapagensis*, *N. separatus*, *N. vulgatus galapagensis*.

Geospiza dubia.—*Nirmus galapagensis*, *N. vulgatus galapagensis*.

Geospiza fortis.—*Colpocephalum milleri*, *Docophorus breviformis*, *D. galapagensis*, *Menopon incertum*, *Nirmus galapagensis*, *N. interpositus*, *N. separatus*, *N. vulgatus galapagensis*.

Geospiza fuliginosa.—*Colpocephalum milleri*, *C. spineum*, *Docophorus communis*, *D. galapagensis*, *D. insulicola*, *D. platycephalus*, *Goniocotes galapagensis*, *Lipeurus baculus*, *L. exiguus*, *L. helleri*, *L. languidus*, *L. miriceps*, *Menopon albemarlei*, *M. incertum*, *Nirmus galapagensis*, *N. gloriosus*, *N. interpositus*, *N. lepidus*, *N. vulgatus*, *N. vulgatus galapagensis*.

Geospiza intermedia.—*Nirmus vulgatus galapagensis*.

Myriarchus magnirostris.—*Nirmus galapagensis*, *N. vulgatus galapagensis*, *Physostomum angulatus*.

Nesomimus adamsii.—*Nirmus vulgatus galapagensis*.

Nesomimus carringtoni.—*Docophorus peristictus*, *Docophorus validus minor*, *Menopon incertum*, *Nirmus galapagensis*, *N. gloriosus*, *N. interpositus*, *N. lepidus*, *N. vulgatus galapagensis*.

Nesomimus macdonaldi.—*Docophorus melanocephalus*, *Menopon galapagensis*, *M. incertum*, *Nirmus galapagensis*, *N. vulgatus galapagensis*.

Nesomimus melanotis.—*Lipeurus baculus*, *Nirmus galapagensis*.

Nesomimus parvulus.—*Docophorus galapagensis*, *Lipeurus languidus*, *Menopon incertum*, *Nirmus galapagensis*, *N. interpositus*, *N. vulgatus galapagensis*.

Nesopelia galapagensis.—*Nirmus curvilineatus*.

Oceanites gracilis.—*Docophorus platycephalus*, *Goniocotes galapagensis*, *Lipeurus exiguus*, *L. languidus*, *Menopon incertum*, *Nirmus curvilineatus*.

Procellaria tethys.—*Lipeurus languidus*, *L. potens*, *Menopon incertum*, *Nirmus galapagensis*.

Progne modesta.—*Docophorus breviformis*, *Menopon incertum*, *Nirmus gloriosus*, *N. separatus*.

Puffinus subalaris.—*Docophorus validus minor*, *Giebelia mirabilis*, *Lipeurus diversus*, *L. diversus major*, *L. limitatus*, *Menopon narboroughi*.

Pyrocephalus dubius.—*Nirmus galapagensis*.

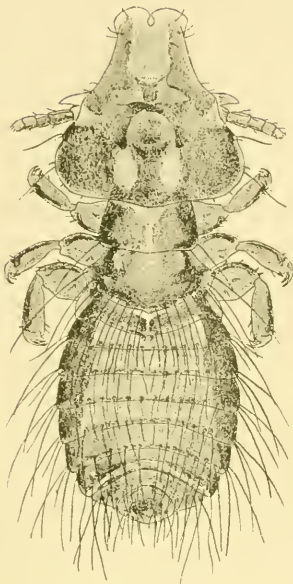
Pyrocephalus intercedens.—*Docophorus insulicola*, *Lipeurus languidus*, *Menopon incertum*, *Nirmus galapagensis*, *N. vulgatus galapagensis*.

Sterna fuliginosa (Clipperton Island).—*Docophorus icterodes*, *D. melanocephalus*, *D. peristictus*, *Lipeurus gracilicornis major*, *L. helleri*, *L. potens*, *Nirmus gloriosus*, *N. lepidus*, *N. obtusus*, *N. separatus*, *N. vulgatus galapagensis*.

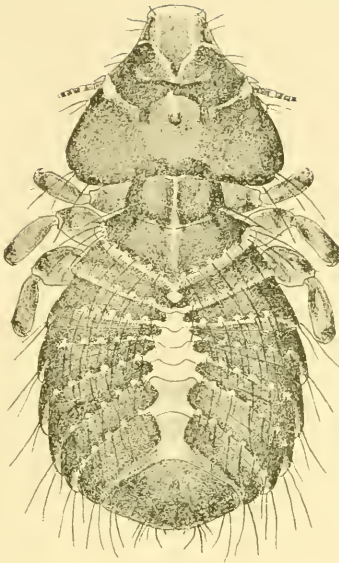
Sula piscator.—*Lipeurus helleri*, *L. languidus*, *L. potens*.

PLATE XXVIII.

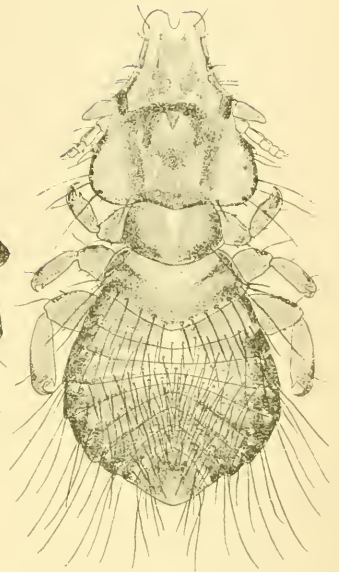
- FIG. 1. *Docophorus platycephalus*, male.
2. " *peristictus*. male.
3. " *breviformis*, male.
4. " *galapagensis*, male.
5. " *albemarlensis*, male.
6. " *insulicola*, male.



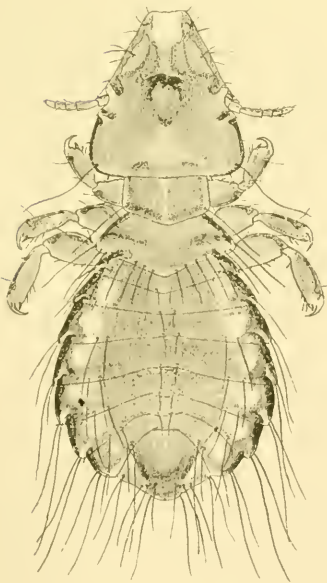
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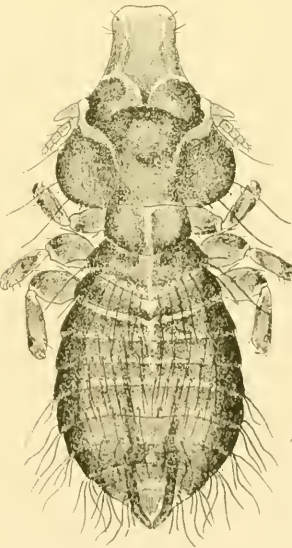
2



3



4



5



6

PLATE XXIX.

- FIG. 1. *Nirmus gloriosus*, male.
2. " *obtusus*, female.
3. " *paludicola*, female.
4. " *curvilineatus*, male.
5. " *galapagensis*, male.
6. " *separatus*, male.
7. " *lepidus*, male.
8. *Lipeurus languidus*, male.

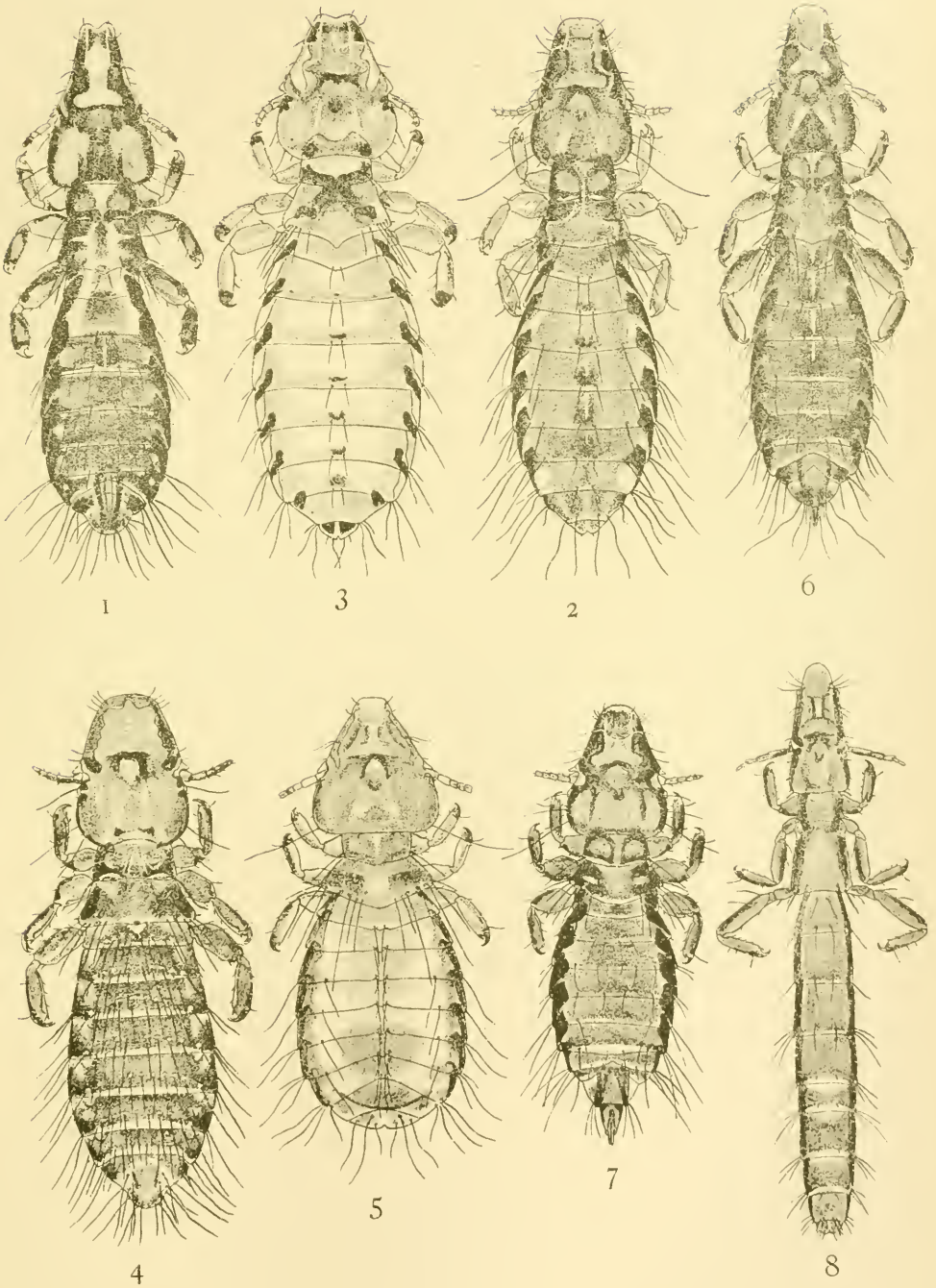
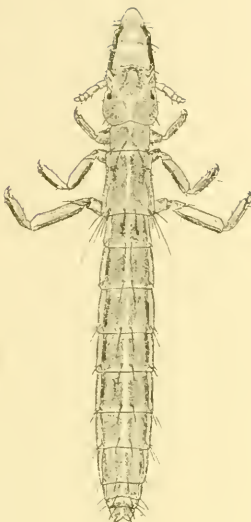


PLATE XXX.

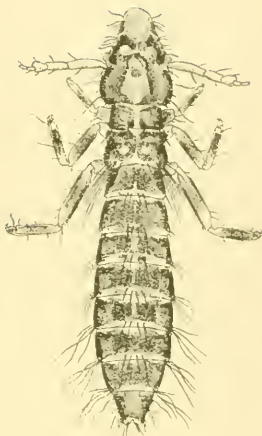
- FIG. 1. *Lipeurus potens*, male.
2. " *exiguus*, female.
3. " *helleri*, male.
4. " *miriceps*, male.
5. *Goniocotes galapagensis*, male.
6 *Colpocephalum milleri*, male.



1



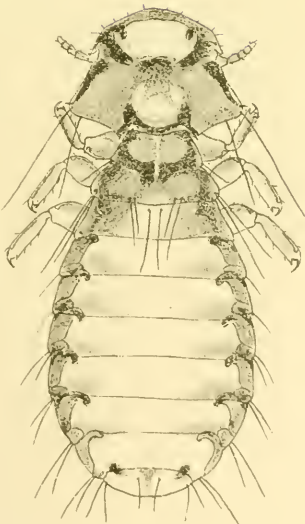
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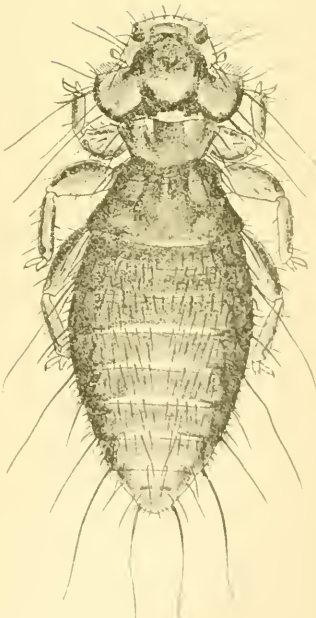
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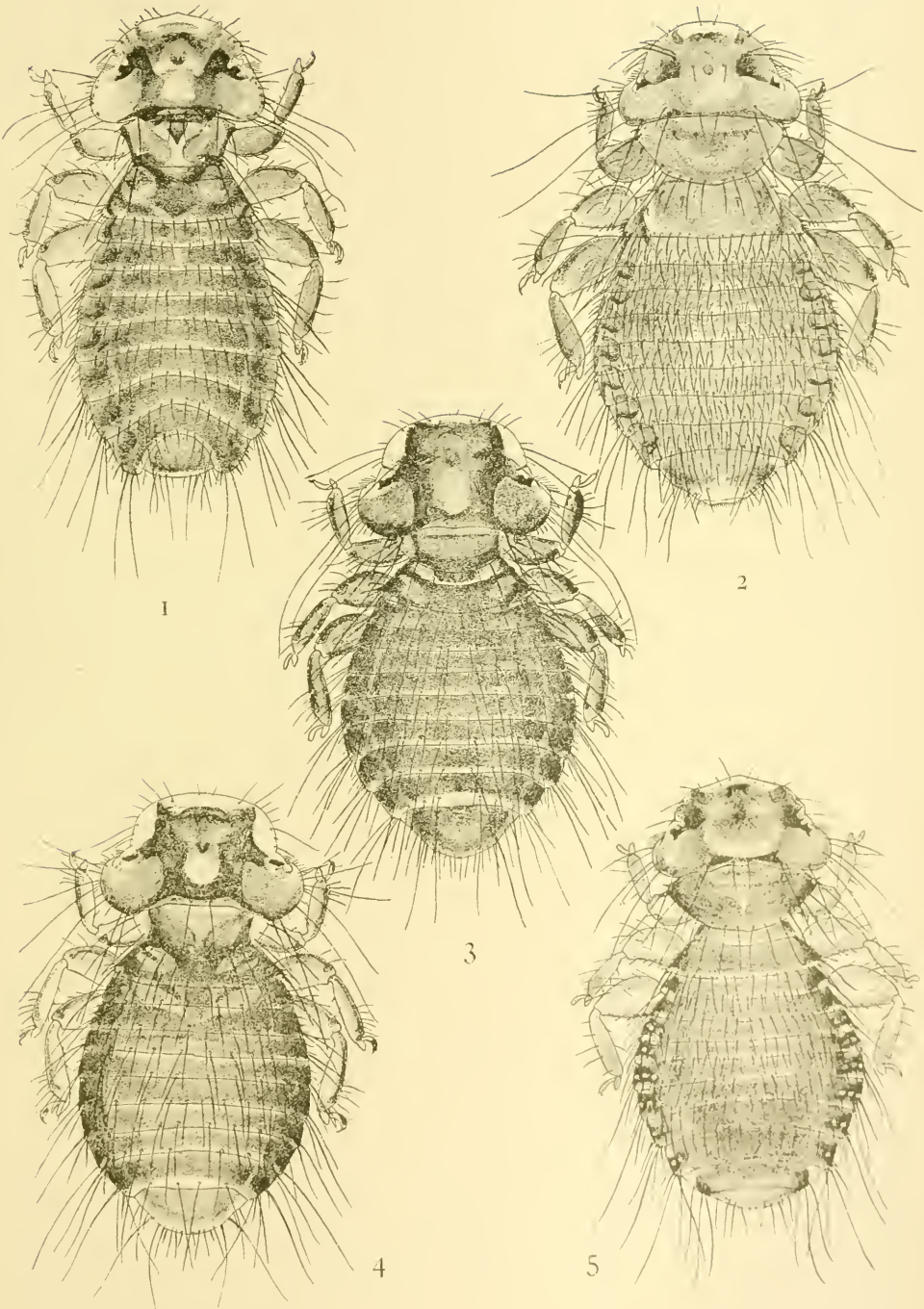
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6

PLATE XXXI.

- FIG. 1. *Menopon singularis*, female.
2. " *narboroughi*, female
3. " *snodgrassi*, female.
4. " *galapagensis*, female.
5. " *albemarlei*, female.



GALAPAGOS MALLOPHAGA

ANDERSON, 1908, PLATE XXXI.

INDEX

NOTE.—New species and varieties in **blackface** type.

- | | |
|---|--|
| <p>Ancistrona gigas 483 Colpocephalum milleri 483 spineum 484 unciferum 459, 484 Docophorus albemarlensis 465 breviformis 463 communis 464 galapagensis 464 icterodes 462 insulicola 466 lari 463 melanocephalus 462 peristictus 462‡ platycephalus 461 validus minor 460 Eurymetopus brevis 482 Giebelia mirabilis 482 † Gonicotes galapagensis 481 Lipeurus baculus 478 diversus 476 diversus major 477 exiguus 479 gracilicornis major 477</p> | <p>Lipeurus—continued helleri 479 languidus 475 limitatus 476 miriceps 480 potens 477 Menopon albemarleii 488 galapagensis 487 incertum 488 narboroughi 485 singularis 485 snodgrassi 486 Nirmus curvilineatus 470 galapagensis 471 gloriosus 458, 467 lepidus 473 obtusus 468 paludicola 469 separatus 472 vulgatus 458, 474 vulgatus galapagensis 474 interpositus 475 Physostomum angulatum 483</p> |
|---|--|

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PAPERS FROM THE HOPKINS STANFORD GALA-
PAGOS EXPEDITION, 1898-1899.

XI.

THE BIRDS OF CLIPPERTON AND COCOS
ISLANDS.

BY ROBERT EVANS SNODGRASS AND EDMUND HELLER.

CONTENTS.

| | |
|---|-----|
| Clipperton Island, described | 501 |
| Cocos Island, described | 504 |
| Systematic account of the birds | 505 |

CLIPPERTON ISLAND.

CLIPPERTON ISLAND bears the distinction of being the only coral island of the eastern Pacific. It is a true atoll, two miles across in its longest diameter. It lies in latitude $10^{\circ} 17'$ north and longitude $109^{\circ} 13'$ west, being almost directly south of Cape San Lucas, Lower California, and west of the northern part of Costa Rica. It is about 600 miles distant from the nearest place on the mainland, which is Tejupan Point at the south end of Manzanilla Bay, between San Blas and Acapulco, Mexico. Politically it belongs to Mexico.

Its climate is hot and very humid. The water about it is warm and the currents westerly. The Mexican current, which flows southeast along the coast of Mexico, is deflected to the westward in the latitude of Clipperton. Hence, the currents which bathe the island come directly from the mainland, and are responsible for the animals and plants now carried there by

natural agencies. The land fauna is very scant and its relationships have not yet been determined. Besides birds a lizard, *Lagosoma erundeli*, occurs there; also an Agrionid dragonfly, a Cicindelid beetle and a very few Diptera. The nymphs of the dragonflies live in the brackish lagoon inside the circular coral bank. No land plant is native to the island, and the birds and crabs are everywhere so abundant that no plant could possibly grow there unless artificially protected.

The island is roughly circular, being composed of a narrow ring formed of sand and pieces of coral. Its width varies from 200 to 1,300 feet, averaging in most places between 300 and 600 feet. The interior of the island is occupied by a lagoon of brackish water full of algæ. According to P. J. Henning's chart of Clipperton Island, made in 1897, its depth, near the center is forty fathoms, and at one point south of the center, fifty-five fathoms. Everywhere near the shore it is shallow, but the bottom slopes off very irregularly toward the center. The depth varies slightly, probably according to the rainfall, for the lagoon was, in 1898, entirely shut off from the ocean. According to Henning's chart the water over a reef in the middle of the lagoon is only from two to eight inches deep. During our visit in November, 1898, the reefs were everywhere two feet, and in most places much more, beneath the surface of the water. This reef crosses the middle of the lagoon in a northwest-southeast direction along the line of the greatest diameter of the atoll. Near the northwest shore of the lagoon are several small islands on which one of the terns of the island, *Sterna fuliginosa*, was nesting in great numbers during our visit.

The height of the island is uniformly very low and its surface flat, except on the outer side where it slopes off rather steeply to the ocean, and on the inner side where it slopes more gently to the lagoon. Everywhere, except at one place to be mentioned later, it is composed of irregular fragments of coral stems. Where sections of the banks have been cut by water, the material below the surface is seen to be exactly the same as that at the surface, except that it is compacted into solid beds. No coral sandstone rocks were found. The pieces of coral

scattered about just above high-water mark have smoothed and polished surfaces, though still preserving their branched shapes. Lower down the coral fragments are worn by the waves to rounded pebbles, and finally ground up into sand. All around the island a sloping reef runs outward from high-water mark. Its variable width is generally equal to or slightly greater than the part of the island above water. Soundings at the anchorage on the north side of the island at a distance of seven hundred feet from the outer edge of the reef show depths of 38, 46 and 60 fathoms, while at the edge of the reef, just outside of low-water mark, the depth is only about 20 fathoms.

Near the middle of the east side of the island is a large mass of dark igneous rock, about sixty feet high, which is not found elsewhere on the island. It is much eroded by water; its exterior is cut into numerous pinnacles and irregular projections, and its interior is hollowed out by caves. Large passageways extend entirely through the mass. The rock is so worn by the water that it has the appearance of being a large isolated block of sandstone. It is, however, simply the surviving remnant, above water, of the original volcanic island on which the coral atoll has been built. In places the surface of the rock is decomposed into a soft, whitish material, easily broken between the fingers. The excrement of birds upon it in other places has made on the surface a white, glassy formation.

Boobies and terns inhabit the island in enormous numbers. The phosphates of their excrement, for they feed almost entirely on fish, have acted chemically on the calcium carbonate forming the coral surface of the island, and have in places transformed large beds of this coral into calcium phosphate. The island was leased from Mexico in 1898 by the Pacific Islands Company for the purpose of exporting this coral phosphate for fertilizing purposes. Where good formations are found the mixture is dug up, broken into small pieces, dried, sacked and shipped without further preparation. The chemist on the island, Mr. F. T. Shepherd, told us that this exported product yields from 70 to 80 percent of phosphates.

We visited Clipperton Island November 23 and 24, 1898, and to the representatives of the Pacific Islands Company sta-

tioned there at that time we are indebted for generous hospitality, and for aid given in obtaining specimens of the fauna of the island.

COCOS ISLAND.

Cocos Island lies in latitude $5^{\circ} 33'$ north and longitude $87^{\circ} 2'$ west. It is about four miles long in its longest diameter, which is east and west, and has a circumference of about thirteen miles. Its highest part, on its western side, is visible from a distance of sixty miles. The island is mountainous, presenting on all sides perpendicular cliffs, and above these steep slopes and canyons. The northern side, however, has several indentations. Chatham Bay, on the northeast shore, is well protected from the oceanic swells, and affords good anchorage in fourteen fathoms half a mile from land. At the middle of the shore of the bay is a sand-beach, on which an easy boat-landing may be made, for in quiet weather the surf is low. Streams of fresh water flow down on all sides of the island, in most places pouring over the cliffs into the ocean. About Chatham Bay the slope is gentler than at most other places, for here a large canyon comes down to the beach, and the stream in its bed cuts through the sand of the beach into the ocean. Wafer Bay, on the northwest side of the island, about a mile from Chatham Bay, is said to be a much inferior anchorage, on account of its deeper water and the heavy swell that enters it.

The rock composing Cocos Island is volcanic, but is not made up of layers of lava as is the case with the Galapagos, Rivillagigido and Guadalupe Islands, but, at least about Chatham Bay, forms one solid mass as does the volcanic rock on Clipperton Island. The surface is greatly eroded, there being everywhere, as before stated, numerous deep canyons, and the rock is almost everywhere covered by a rich shallow soil.

The climate resembles that of Clipperton, being extremely humid. The island lies in the warm counter equatorial current which flows past Cocos in an easterly direction toward Panama Bay, where its waters are deflected to the north and south. With the currents flowing as they now do, it is apparently impossible for plants or animals to be carried by them from the mainland to Cocos Island.

The vegetation is extremely rich, though the number of plant species is few. Everywhere a dense green covering of tall trees and smaller undergrowth clothes the irregular mountain slopes and ridges. In this respect Cocos strongly contrasts with any other island of the eastern tropical Pacific. Guadalupe Island, the Rivillagigido and Galapagos archipelagos are for the most part dry and barren, even the wettest parts of the Galapagos being far less humid and less thickly covered with vegetation than is Cocos.

Animal life on Cocos Island is very scarce. Besides the birds there is present a rat, *Mus norvegicus*, brought hither by vessels that have touched here for wood and water. A lizard, *Anolis townsendi*, is rather numerous. With the exception of a snake reported by Townsend this lizard and the birds are the only native land vertebrates known. Hogs have been introduced and now run wild on the island. Insects are very scarce. One *cicada* occurs but is rare. We obtained one nymph of it in July but saw no adults. A fly, *Leucomelina pica*, is somewhat plentiful. There is one ant, *Tetramorium auropunctatum*, that is extremely numerous, occurring in great numbers on the leaves of all the vegetation. It is minute but its bite is excessively annoying, causing an almost unendurable irritation of the skin. Its presence makes travelling on the island exceedingly disagreeable. We visited Cocos Island June 30 to July 3, 1899.

SYSTEMATIC ACCOUNT OF THE BIRDS.

STERNA FULIGINOSA Gmelin.

Sterna fuliginosa GMELIN, Syst. Nat., 1, p. 605, 1788.—ROTHSCHILD AND HARTERT, Novitates Zoölogicæ, VI, p. 191, 1899 (Galapagos).—SAUNDERS, Cat. Birds Brit. Mus., XXV, p. 106, 1896.

Range.—Intertropical waters and adjacent regions. In the eastern Pacific: Mazatlan, Panama, Rivillagigido Islands, Clipperton Island, Galapagos Islands (Rothschild), Hawaiian Islands.

Adult Female.—Cat. No. 3826, Stanford University Museum, from Clipperton Island, Nov. 23, 1898. Upper parts sooty black, almost glossy black on nape and top of head. Primaries, except the first, with silvery-gray bloom on upper edge of each barb. Outermost tail feathers long, slender and tapering, reaching 45 mm. beyond second

and 93 mm. beyond the middle pair; their outer webs and basal two thirds of inner webs white; inner web on its terminal third passing into dark brown but paling again near the tip. Inner edge of folded wing white. Forehead white, the white prolonged backward on each side of head as a white line to above the fore part of the eye. Lores black, connected with the black of top of head by a narrow black band above and another below the eye. Sides of head, under wing coverts and entire under parts white; a grayish tinge on posterior part of the belly and under tail coverts. Under surfaces of primaries and rectrices grayish-brown, under surfaces of their shafts ivory white. Bill and feet, in the dried skin, black with a slight purplish or reddish tinge.

None of the male specimens have the outer tail feathers well developed as streamers. In nearly all they are plain dark brown, grayish at base, and but little longer than the second pair of rectrices. One male has the outer pair grayish on the outer webs. None of the specimens show the "flecks of white on the lores and crown" mentioned by Saunders.

All the specimens, seven in number, six male and one female, are adult and were taken at Clipperton in November, 1898. Their measurements follow.

MEASUREMENTS, IN MILLIMETERS, OF *Sterna fuliginosa*.

| Catalogue Number. | Sex. | Length. | Wing. | Tail. | Culmen. | Depth of Bill at Base. | Tarsus. | Middle Toe. |
|-------------------|---------|---------|-------|-------|---------|------------------------|---------|-------------|
| 3820 | Male. | 390 | 286 | 140 | 41 | 10.5 | 22.5 | 20 |
| 3821 | Male. | 385 | 283 | 128 | 39 | 10 | 22 | 19.5 |
| 3824 | Male. | — | 286 | 130 | 41 | 11.5 | 23 | 19 |
| 3826 | Female. | 403 | 283 | 178 | 41 | 11 | 20 | 19 |
| 3827 | Male. | 419 | 288 | 147 | 43.5 | 11.5 | 22 | 19 |
| 3828 | Male. | 380 | 282 | 138 | 41 | 12 | 22.5 | 18 |
| 3829 | Male. | 407 | 280 | 155 | 40 | 11 | 21.3 | 18.5 |

The average length of culmen, from the above table, is 41 mm. which is considerably shorter than that given by Saunders¹ and by Ridgway.² The table also shows that the wings do not exceed 288 mm. in length. Rothschild³ also noted the shortness of the wings in his specimens from the Galapagos, stating, however, that in one specimen they reached 310 mm.

These birds were extremely abundant on and about the small islands in the northwest part of the Clipperton lagoon where they were nesting,

¹Saunders, Cat. Birds Brit. Mus., xxv, p. 106.

²Ridgway, Manual of N. A. Birds, 2d ed., p. 45.

³Rothschild, Novitates Zoologicae, vi, p. 191.

but only a few were seen elsewhere on the atoll. About the rookery they were exceedingly noisy. All seemed to utter the same sounds, but so great and continuous was the general din that individual voices could hardly be distinguished. The sounds, however, differed from those of *Anous*, mentioned below, in being much less distinctly composed of a series of notes. They were more continuous, yet had a fairly evident separation into three similar syllables. When driven from their eggs the birds flew up in great numbers uttering the same notes loudly and harshly. The eggs are laid singly on the bare rock. In color they are creamy whitish, marked with dark brown blotches and specks of varying intensity. Sometimes spots of all sizes are evenly distributed over the entire egg, in other cases the larger blotches are accumulated in a circle about its larger end. Some have no large blotches, the markings consisting entirely of small dark spots, or occasionally with very pale, almost obsolete blotches. One egg appears very different from the rest, being thickly covered uniformly with large elongate daubs of reddish-brown, all placed obliquely in the same direction. Size, 46×33 to 54×38 mm.

ANOUS STOLIDUS RIDGWAYI Anthony.

Anous stolidus rousseaui RIDGWAY, Proc. U. S. Nat. Mus., XIX, p. 645, 1896 (Cocos Island).

Anous stolidus ridgwayi ANTHONY, Auk, XV, p. 36, Jan., 1898 (Cocos and Socorro Islands).

Range.—Eastern Pacific, north of the Galapagos: known from the Rivallagido Islands, Clipperton Island, Cocos Island and the coast of Mexico. Boundary between this form and *A. stolidus rousseaui* (Hartlaub) not known.

Adult Female.—Cat. No. 5218, Stanford University Museum, from Cocos Island, July 1, 1899. Top of head pearl gray, almost white anteriorly, entirely white along a narrow line from bill to eye, bordering the lores. Back of head becoming gradually darker, merging into the brown of the mantle. Back, scapulars, upper tail coverts, wing coverts and tertiaries pure dark sooty-brown. Alula darker dusky-brown. Primaries and secondaries still darker blackish-brown, slightly paler on the inner webs. Rectrices same color as the wing feathers. Under wing coverts dark grayish-brown. Rest of under parts uniform in color with the back. Throat with a very dark plumbeous tinge, giving it a blackish tone in some lights. Lores and line from lores above the eyes black. A white spot in the supraocular part of this line above the posterior part of the eye. Sides of head dark plumbeous. Lower eyelid edged with white. Bill black. Feet dark brown.

Immature Male.—Similar to adult, somewhat lighter on belly; feathers of back, wing coverts, rump and upper tail coverts with reddish-brown edgings. Lores blackish-brown. Pale color of top of head dead white, lacking the pearly or plumbeous hue of the adult, closely mottled or streaked with brown, ending abruptly against the color of the back. No plumbeous on the sides of head or throat.

According to Anthony this species is "much darker and less brown than *A. rousseaui*, resembling in this respect *A. galapagoensis*, from which it differs in the much paler cap."

We have four adult females and three immature males from Cocos Island, taken in July, and three adult females from Clipperton Island, taken in November.

In the following table we give the measurements in millimeters of our adult specimens from Clipperton and Cocos Islands, and also, for comparison, Ridgway's averages for *Anous stolidus rousseaui*.¹

MEASUREMENTS, IN MILLIMETERS, OF *Anous stolidus*
ridgwayi.

| Catalogue Number. | Sex. | Length. | Wing. | Tail. | Culmen. | Depth of Bill at Base. | Tarsus. | Middle Toe. | Graduation of Tail. | Locality. |
|-------------------|---------|---------|-------|-------|---------|------------------------|---------|-------------|---------------------|-------------|
| 3822 | Female. | 420 | 270 | 158 | 38.5 | 9.7 | 24 | 31 | 58 | Clipperton. |
| 3830 | Female. | 435 | 280 | 168 | 40.7 | 10.3 | 23 | 29 | 57 | " |
| 3831 | Female. | 410 | 270 | 173 | 39 | 9.5 | 23.5 | 31 | 53 | " |
| 5014 | Female. | 418 | 270 | 156 | 38.5 | 10.5 | 24 | 30.5 | 53 | Cocos. |
| 5053 | Female. | 422 | 272 | 157 | 41 | 10 | 24 | 30 | 60 | " |
| 5077 | Female. | 420 | 273 | 163 | 38 | 10.3 | 23 | 31 | 56 | " |
| 5218 | Female. | 430 | 282 | 172 | 38 | 10 | 24.7 | 31 | 61 | " |
| Averages. | Female. | 422 | 274 | 164 | 39 | 10 | 23.7 | 30 | 56.8 | |

Anous stolidus rousseaui.

| | | | | | | | | | | |
|-----------|---|---|-----|-----|----|----|----|----|----|----------------|
| Averages. | — | — | 278 | 160 | 41 | 10 | 26 | 31 | 58 | Pacific Ocean. |
| Averages. | — | — | 273 | 152 | 43 | 10 | 26 | 30 | 55 | Indian Ocean. |

This tern was very abundant in November on the high rock of the eastern side of Clipperton Island, while the other one, *Sterna fuliginosa*, kept almost exclusively in the neighborhood of the small islands in the lagoon. The *Anous*, while sitting on the rock ledges, gave forth almost incessantly a harsh chattering sound describable as a loud, harsh, broken note, or better, perhaps, as several similar harsh notes run together into a single series. This sound is varied by distinctly

¹Proc. U. S. Nat. Museum, vol. xix, p. 645, 1896.

separating the first syllable from the others, the variation being noticed especially when the birds were flying. When sitting on the ground they were generally quiet—in striking contrast to their noisiness while on the rock. When a flock rose from the ground, even as a result of disturbance, the members seldom made any sound.

One egg was obtained. In color, shape and size it is indistinguishable from those of *Sterna fuliginosa*. Color, creamy-white with distinct blotches and spots of dark brown mostly about the larger end, amongst these spots similar, very pale, almost obsolete markings. Size 52×38 mm.

We found this species common on Cocos Island in July.

MICRANOUS DIAMESUS Heller and Snodgrass.

Micranous diamesus HELLER AND SNODGRASS, The Condor, III, No. 3, May, 1901, p. 76 (Cocos and Clipperton Islands).

Range.—Cocos and Clipperton Islands, eastern tropical Pacific.

Adult Male.—Type of species. Cat. No. 5079, Stanford University Museum, from Cocos Island, July 1, 1899. Forehead and top of head almost pure white, back part of head and nape with a plumbeous tinge. Lower part of neck plumbeous, darkening into dark plumbeous on the shoulders and then into brown on the mantle. Rest of upper parts, except upper tail coverts and tail, dark dusky-brown; outer webs of outer primaries sooty-brown, almost black. Upper tail coverts and tail dark plumbeous-gray. Under parts dusky-brown, darkest on lower breast and on belly. Lower tail coverts somewhat lighter plumbeous-brown. Tail below same color as above. Lores and superciliary line black, a small white spot in the latter above the posterior part of the eye. Lower two thirds of lower eyelid white. Cheeks deep, dark plumbeous, the pale color of back of head scarcely extending upon the lateral parts.

Immature Male.—Top of head pure white, with a few brown feathers posteriorly. Outer webs of outer primaries blackish-brown, that of the first almost black. Lores, superciliary line and cheeks dusky brown. All other parts sooty-brown with no dusky tinge except on the lower part of throat.

This species is intermediate between *M. leucocapillus* Gould of the Caribbean Sea, Atlantic and Indian Oceans and the western Pacific, and *M. hawaiiensis* Rothschild of the Hawaiian Islands in both color of plumage and size of bill. It differs from *M. hawaiiensis* in being darker on the shoulders, on lower part and sides of neck, and on sides of head, and in having a longer and thicker bill and a longer middle

toe.¹ In *M. hawaiiensis* the pale slaty plumbeous color of the back of the head and neck reaches so far ventrally on the sides of the head and neck, and even on the upper part of the breast, that there is distinctly marked off on the chin and throat a median longitudinal area of dark plumbeous-brown well defined on each side against the paler lateral parts.

We are indebted to Mr. R. C. McGregor for the loan of an immature male of *Micranous hawaiiensis*, and to Mr. William Alanson Bryan for an adult male of the same species from the Bernice Panahi Bishop Museum of Honolulu.

The collection contains 10 specimens in all, there being 1 adult male, 4 adult females and 2 immature females, taken on Cocos Island in July; and 3 immature specimens, 1 male and 2 female, taken on Clipperton Island in November. Their measurements follow:

MEASUREMENTS, IN MILLIMETERS, OF *Micranous diamesus*.

| Catalogue Number. | Sex. | Length. | Wing. | Tail. | Culmen. | Depth of Bill at Base. | Maxilla from Nostrils. | Gonys. | Tarsus. | Middle Toe. | Locality. |
|-------------------|---------|---------|-------|-------|---------|------------------------|------------------------|--------|---------|-------------|-------------|
| 5015 | Adult ♀ | 360 | 241 | 131 | 43 | 8.3 | 32 | 28 | 21 | 26.5 | Cocos. |
| 5026 | ♀ | 370 | 231 | 129 | 43.5 | 8 | 32 | 30 | 21 | 26.5 | " |
| 5079 | ♂ | 388 | 244 | 130 | 45.3 | 8.7 | 33 | 30 | 21.5 | 28.3 | " |
| 5111 | ♀ | 356 | 223 | 121 | 43 | 8.7 | 31.5 | 29 | 21 | 25.7 | " |
| 5205 | ♀ | 372 | 233 | 130 | 43.5 | 9 | 31 | 28 | 20 | 26.7 | " |
| 3819 | Imm. ♀ | 368 | 225 | 121 | 43.5 | 8.5 | 32 | 30 | 21 | 27 | Clipperton. |
| 3825 | ♀ | 360 | 223 | 121 | 44 | 8.7 | 31.5 | 28 | 20.5 | 27 | " |
| 5036 | ♀ | — | 230 | 120 | 45.5 | 8.3 | 31.5 | 30 | 21 | 29.5 | Cocos. |
| 5249 | ♀ | — | 233 | 123 | 43.5 | 9 | 31 | 28 | 21 | 27 | " |
| Averages | Adult. | 369 | 230 | 128 | 43.6 | 8.4 | 32 | 29 | 21 | 26.9 | |

Micranous hawaiiensis.

| | | | | | | | | | | |
|---------|-----|-----|-----|------|-----|----|----|------|----|-------------------|
| Adult ♂ | 382 | 225 | 125 | 38.5 | 8 | 28 | 28 | 21.5 | 24 | Hawaiian Islands. |
| Imm. ♀ | — | 210 | 118 | 38 | 7.5 | 25 | 25 | 20 | 24 | |

This species was rather abundant in July on Cocos Island, where it was nesting with *Gygis candida* in the tops of tall trees a short distance inland at Chatham Bay. On Clipperton Island we found only immature birds in November. They were associated with *Anous stolidus ridgwayi*.

¹The statement in *The Condor*, III, No. 3, May, 1901, p. 76, that *Micranous diamesus* differs from *Micranous hawaiiensis* "in having a more slender and shorter bill and shorter tarsus" is a mistake and should read as given above.

GYGIS CANDIDA (Gmelin).

Sterna candida GMELIN, Syst. Nat., 1, p. 607, 1788.

Gygis candida SAUNDERS, Cat. Birds Brit. Mus., XXV, p. 149, 1896.

Range.—Intertropical. In the eastern Pacific: Cocos and Clipperton Islands. Not heretofore recorded from American waters.

Adult Male and Female.—Plumage above and below pure white. A narrow black ring around the eye. Shafts of wing quills, the greater wing coverts and rectrices dark brown. Bill (in life) blue at base, black distally. Feet with tarsus and toes blue, claws black, webs white.

The collection contains 6 adult specimens, 1 male and 5 female, from Cocos; also the wing of a specimen from Clipperton. We did not secure a specimen on Clipperton, although one evening we saw an individual alight on one of the houses on the island. The occupants of the house said that the birds frequently come there, but were never common. Mr. F. I. Shepherd, chemist on the island, gave us the wing of one of the birds that had been killed on the island. Measurements of the six adult specimens are as follows:

MEASUREMENTS, IN MILLIMETERS, OF *Gygis candida*.

| Catalogue Number. | Sex. | Length. | Wing. | Tail. | Culmen. | Depth of Bill at Base. | Maxilla from Nostril. | Gonys. | Tarsus. | Middle Toe. |
|-------------------|---------|---------|-------|-------|---------|------------------------|-----------------------|--------|---------|-------------|
| 5022 | Female. | 325 | 237 | 123 | 40 | 11.5 | 28.5 | 28 | 14 | 22.5 |
| 5052 | Female. | 338 | 248 | 120 | 38 | 11 | 25 | 22 | 12 | 21.5 |
| 5057 | Female. | 317 | 234 | 119 | 39 | 11.5 | 25.5 | 25 | 12.5 | 21 |
| 5096 | Female. | 336 | 252 | 125 | 39 | 12 | 25 | 23 | 12 | 21 |
| 5148 | Male. | 337 | 252 | 124 | 37 | 11.5 | 24 | 24 | 13.3 | 21.5 |
| 5302 | Female. | 350 | 252 | 130 | 40 | 11 | 27 | 25 | 14 | 23 |
| Averages. | | 334 | 246 | 123.5 | 39 | 11.4 | 26 | 24.5 | 13 | 21.8 |

Abundant in July at Cocos Island, where it was nesting in the tops of tall trees a short distance inland, in company with *Micranous diamesus*. We did not secure any eggs. The nests, built of twigs, somewhat resembled those of a crow. Many nests were frequently found in one tree. The birds were difficult to obtain from the water, for in flying back and forth from their nests they nearly always remained at the same elevation as the nests.

HETERACTITIS INCANUS (Gmelin).

Scolopax incana GMELIN, Syst. Nat., Ed. x, Vol. 1, p. 658, 1788.

Heteractitis incanus RIDGWAY, Proc. U. S. Nat. Mus., XIX, p. 632, 1896 (Galapagos).—ROTHSCHILD AND HARTERT, Novitates Zoologicae, VI, p. 188, 1899 (Galapagos).

Range.—Eastern Pacific Ocean. Occurs at Guadalupe Island,

Rivillagigido Archipelago, Cocos Island and Galapagos Archipelago.

We saw one individual of this species at Chatham Bay, Cocos Island, in July.

SULA CYANOPS (Sundevall).

Dysporus cyanops SUNDEVALL, Phys. Tidskr., Pt. v, p. 218, 1837.

Sula cyanops OGILVIE-GRANT, Cat. Birds Brit. Mus., XXVI, p. 430, 1898.

Range.—Intertropical. In the Eastern Pacific: Clipperton Island and the Rivillagigido Archipelago.

Adult Male and Female.—Pure white except primaries, secondaries, tertiaries, greater wing coverts and rectrices, which are sooty-brown. Tail feathers white at base; inner webs of secondaries whitish toward base; basal half of tertiaries white; shafts of wing quills black, of median tail feathers yellowish-white. Bill plain horn-yellow. Feet, in dried skin, dark brown.

This bird is identical in plumage with *Sula variegata* of the coast of South America and the Galapagos Islands, differing from it in having no red color on the bill, which is yellow. There are also some differences in proportions.

The collection contains four adult males, all taken at Clipperton in November.

MEASUREMENTS, IN MILLIMETERS, OF *Sula cyanops*.

| Catalogue Number. | Sex. | Length. | Wing. | Tail. | Culmen. | Depth of Bill at Base. | Tarsus. | Middle Toe. |
|-------------------|-------|---------|-------|-------|---------|------------------------|---------|-------------|
| 4274 | Male. | 800 | 410 | 210 | 101 | 43 | 53 | 80 |
| 4278 | Male. | 790 | 432 | 230 | 106 | 44 | 58 | 80 |
| 4280 | Male. | — | 423 | 225 | 105 | 44 | 54 | 81 |
| 4283 | Male. | 810 | 408 | 222 | 100 | 44 | 54 | 77 |
| Averages. | | 800 | 418 | 222 | 103 | 44 | 55 | 80 |

On Clipperton this bird was found breeding in immense numbers in November. The nests consisted of slight depressions scraped in the coral sand and contained one or two eggs each. The nesting had just begun for no incubated eggs or young birds were seen. A set generally consisted of two eggs, but we were assured by people living on the island that only one young bird of each pair is reared, the other being left by its parents to starve on account of the extreme voracity of the young. The young, we were told also, are taught to swim and dive in the quiet water of the lagoon before venturing out on the open ocean.

The most common note uttered by the adults was a loud *quack*. Occasionally a sharp whistle was heard, but no special significance to this sound was observed.

The species was observed fishing at sea, three hundred miles from the island, and it is probable that the birds in pursuit of food, daily travel more than a hundred miles from their breeding ground.

The eggs are covered with a dull white outer limy coating. The shell beneath this is pale greenish, showing where the former is scraped off. In shape they are regularly ovate to elongate ovate. Size, 62×43 to 72×47 mm.

SULA BREWSTERI Goss.

Sula brewsteri Goss, Auk, v, p. 242, 1888 (San Pedro Matir Island).—OGILVIE-GRANT, Cat. Birds Brit. Mus., xxvi, p. 440, 1898.

Range.—Pacific coast of Mexico and Central America, Rivillagigido Archipelago, Cocos Island.

Adult Male.—Cat. No. 5220, Stanford University Museum, from Cocos Island, July 3, 1899. Feathers of head just back of bare space very pale, nearly pure white above, almost immediately, however, darkening into grayish and then into brownish-gray, passing from this through grayish-brown on the hind neck, sides of head and throat into dark sooty-brown on the back, upper surface of wings, tail and upper breast, the brown darkest on under surface of the primaries. Lower breast and belly pure white. Under wing coverts of secondaries gray and white. Median lower tail coverts white, the lateral ones brown. Bill pale horn-brown. Feet light pea-green.

Adult Female.—Cat. No. 5187, Stanford University Museum, from Cocos Island, July 3, 1899.—Same as the male but the brown color of back and upper breast extending forward uniformly over the neck and head to the bare skin about base of bill. Gular-sac and base of bill pea-green, spot before eye slate-blue. Feet light yellowish; claws horn-blue.

Immature Male.—Cat. No. 3845, Stanford University Museum, from Cocos Island, July 3, 1899. Plain smoky-brown, lighter than the adults. The lower breast and belly with pale grayish edgings to the feathers, giving this region a paler appearance than the other parts. Feathers of top of head, back of neck, back and wing coverts with pale brown edgings. Under wing coverts gray and brown. Bill and gular-sac slate-blue. Feet cream-yellow; claws horn-blue. Iris white.

Both males and females are conspicuously darker than *Sula nesiotus* of Clipperton Island, and the male has much less white on the head and neck.

We found this species fairly common in July on the rocks and islets about Chatham Bay, Cocos Island.

The collection contains 5 specimens, being 3 adult females, 1 adult male and 1 immature male, all taken July 3, 1899, on Cocos Island.

MEASUREMENTS, IN MILLIMETERS, OF *Sula brewsteri*.
(ADULT SPECIMENS.)

| Catalogue Number. | Sex. | Length. | Wing. | Tail. | Culmen. | Depth of Bill at Base. | Tarsus. | Middle Toe. |
|-------------------|---------|---------|-------|-------|---------|------------------------|---------|-------------|
| 5011 | Female. | 757 | 400 | 199 | 94 | 34 | 46 | 80 |
| 5187 | Female. | 780 | 400 | 203 | 96 | 34 | 46 | 82 |
| 5220 | Male. | — | 370 | 215 | 93 | 32 | 40 | 78 |

SULA NESIOTES Heller and Snodgrass.

Sula brewsteri ROTHSCHILD AND HARTERT, Novitates Zoölogicæ, VI, p. 179, 1899 (11° 20' N., 110° W.).

Sula nesiotes HELLER AND SNODGRASS, The Condor, III, No. 3, p. 75, May, 1901 (Clipperton Island).

Range.—Clipperton Island and adjacent waters.

Adult Male.—*Type* of species Cat. No. 4271, Stanford University Museum; from Clipperton Island, November 23, 1898. Upper parts, excepting head and neck, light sooty-brown, deepening on the primaries into purplish-brown. Sides of chest and under wing coverts, except an oblique white bar across middle coverts, brown like the dorsum. Head above and on sides white with a yellowish tinge, becoming ashy or light drab-gray below and posteriorly, gradually shading into smoky-drab on chest and hind neck; color of chest ending abruptly against the white of the belly. The under parts posterior to fore-breast and axillaries and an oblique bar across middle of the under wing coverts white. Coloration of naked parts in life: bill yellowish-green, becoming more greenish basally; gular-sac dark pea-green; bare skin before eye purplish-violet; feet pea-green.

Adult Female.—Like the male in coloration except that the head and neck are uniform with the back in color, and the feathers bordering the naked parts of the head are slightly grayer. Somewhat larger in size than the male.

This species is very similar to *Sula brewsteri* Goss, but the brownish color of the head and upper parts is considerably paler, the bill is green and the feet are green rather than yellowish. In size *S. nesiotes* averages somewhat larger than *S. brewsteri*.

The collection contains four adult specimens, 1 male and 3 female, all taken at Clipperton in November, 1898. Their measurements are as follows:

MEASUREMENTS, IN MILLIMETERS, OF *Sula nesiotēs*.

| Catalogue Number. | Sex. | Length. | Wing. | Tail. | Culmen. | Depth of Bill at Base. | Tarsus. | Middle Toe. |
|-------------------|---------|---------|-------|-------|---------|------------------------|---------|-------------|
| 4271 | Male. | 720 | 384 | 200 | 94 | 32 | 46 | 80 |
| 4272 | Female. | 800 | 405 | 220 | 101 | 35 | 45 | 86 |
| 4275 | Female. | 840 | 404 | 190 | 102 | 37 | 49 | 89 |
| 4279 | Female. | 800 | 416 | 220 | 98 | 33 | 48 | 86 |

SULA PISCATRIX WEBSTERI Rothschild.

Sula piscator RIDGWAY, Proc. U. S. Nat. Mus., XIX, p. 598, 1896 (Galapagos).

Sula websteri ROTHSCHILD, Bull. Brit. Ornith. Club, VII, p. 52, May, 1898 (Clarion Island).—ANTHONY, Auk, XV, p. 311, Oct., 1898 (Rivillagigido Islands).

Sula piscatrix websteri ROTHSCHILD AND HARTERT, Novitates Zoologicae, VI, p. 177, 1899 (Clarion Island and Galapagos Islands).

Range.—Rivillagigido Archipelago, Cocos Island, and Galapagos Archipelago.

Adult Male.—Cat. No. 4273, Stanford University Museum, from Culpepper Island, Galapagos, December 10, 1898. Primaries, secondaries, alula, greater wing coverts and some of under wing coverts dark sooty-brown. Rectrices above and below lighter brown, the barbs with a hoary-gray bloom on their upper edges; the median tail feathers pale toward the tips. All other parts of the plumage plain white. Shafts of the tail feathers white. Shafts of under wing coverts brown.

Bill (in life) pale blue. Bare skin about base of bill pink; circumocular region blue, darker than the bill and darkest immediately about the eye; an uncolored spot just before the eye. Membrane between the rami of the lower mandible purplish-black, mixed with flesh-color basally, entirely of this color anteriorly. A narrow black band extending upward at base of the mandible. Feet red. (Specimen from Clarion Island, August.) In dried specimens the bill varies from horn-yellow to dark reddish with a blackish tip, showing almost no trace of the blue color of fresh specimens.

Immature Female.—Cat. No. 4277, Stanford University Museum, from Culpepper Island, Galapagos, December 10, 1898. Plain ashy brown, darker above and on the wing and tail feathers, dusky on the primaries, palest on the head and neck. Forehead obscurely spotted with dusky. Shafts of median tail feathers yellowish-white.

We found this bird abundant in July at Chatham Bay, Cocos Island, where it perched in the tops of tall trees that overhang the water everywhere along the shore. We did not find it on Clipperton

nor in its vicinity. Its absence there may be due to its preference for nesting in bushes, Clipperton being absolutely destitute of vegetation.

We have no specimens, in the white plumage, from Cocos Island. Three in this plumage from Wenman and Culpepper Islands of the Galapagos group, taken in December, have the tail feathers above and below brown, whitening only at the tips. Three specimens from Clarion Island, one taken in November and the other two in August are colored exactly the same in this respect, the shafts of the feathers in all cases being white. This is exactly as in the *type* described by Rothschild. Rothschild and Hartert had twenty-four specimens of this bird from Clarion Island and the Galapagos. Among these was one that had a white tail. Hence, this variety occasionally duplicates *Sula piscatrix* in the color of its plumage.

The collection contains one male, in white plumage, taken from Clarion Island in August, and three from Wenman and Culpepper Islands, Galapagos, taken in December; one immature male in brown plumage from Cocos Island, taken in July; two immature females, in brown plumage, taken from Cocos Island in July and four from Wenman and Culpepper, taken in December.

There is one specimen of *Sula piscatrix* in the Stanford University collection taken in June near the Hawaiian Islands. Its tail is entirely white. This specimen measures as follows: Wing 360 mm., tail 231, culmen 81, depth of bill at base 28, tarsus 28, middle toe 56.

MEASUREMENTS, IN MILLIMETERS, OF *Sula piscatrix websteri*.
(ADULT SPECIMENS.)

| Catalogue Number. | Sex. | Length. | Wing. | Tail. | Culmen. | Depth of Bill at Base. | Tarsus. | Middle Toe. | Locality. |
|-------------------|---------|---------|-------|-------|---------|------------------------|---------|-------------|------------|
| 3840 | Female. | 775 | 393 | 223 | 92 | 37 | 35 | 64 | Wenman Id. |
| 3841 | Female. | 705 | 395 | 220 | 85 | 34 | 31 | 59 | " " |
| 3842 | Female. | 750 | 403 | 218 | 89 | 32 | 39 | 63 | Clarion " |
| 4273 | Male. | 750 | 385 | 247 | 85 | 31 | 39 | 63 | Wenman " |
| 4282 | Male. | 720 | 371 | 212 | 85 | 36 | 35 | 58 | " " |
| 5009 | Female. | 765 | 395 | 240 | 88 | 34 | 38 | 65 | Clarion " |
| 5024 | Male. | 760 | 407 | 235 | 88 | 34 | 36 | 61 | " " |

FREGATA AQUILA (Linnæus).

Pelecanus aquila LINNÆUS, Syst. Nat., Ed. x, Vol. 1, p. 133, 1758.—ROTHSCHILD AND HARTERT, Novitates Zoologicae, VI, p. 175, 1899 (Galapagos).
Fregata aquila and *Fregata aquila minor* RIDGWAY, Proc. U. S. Nat. Mus., XIX, pp. 590, 591, 1896 (Galapagos)

Range.—Tropical and subtropical parts of the Atlantic and Pacific Oceans. In the Eastern Pacific: Guadalupe Island, Rivillagigido Archipelago, Clipperton Island, Cocos Island and Galapagos Archipelago.

Common everywhere throughout the eastern tropical Pacific, ranging far from land. Breeds on the Rivillagigido and the Galapagos Islands.

DUCK.

A duck, species unknown, we were told by the people living on Clipperton Island, is common in the lagoon during the winter.

COCCYZUS FERRUGINEUS Gould.

Coccyzus ferrugineus GOULD, Proc. Zool. Soc. Lond., p. 104, 1843 (Cocos Island). — GOULD, Zool. Voy. Sulphur, p. 46, pl. 29, 1844. — SCLATER, Proc. Zool. Soc. Lond., p. 167, 1870. — SHELLEY, Cat. Birds Brit. Mus., XIX, p. 303, 1891. — TOWNSEND, Bull. Mus. Comp. Zool., XXVII, No. 1, p. 124, 1895.

Range. — Cocos Island.

Adult Male. — Cat. No. 5250, Stanford University Museum, from Cocos Island, June 30, 1899. Top of head dark plumbeous-gray. Lores and auriculars blackish. Scapulars and fore part of back brownish-olive. Lower part of back and upper tail coverts grayish-olive. Primaries bright rufous, fading into buff at their bases and into brown at their tips. Secondaries olive-brown above, with pale rufous edgings; very pale rufous below. Upper wing coverts the color of the back, with wide rufous edgings. Alula olive-brown, the feathers edged with rufous. Middle tail feathers greenish-bronze, blackening subterminally, with narrow white margins at tips. The other tail feathers black, fading into buff at their bases, each with a large terminal white spot occupying both webs, that of the outer longest, 32 mm. in length. Ventral surface, sides of body and under wing coverts bright buff, whitening on the chin. Bill black except the basal half of the lower mandible which is bright yellow. Feet black. Length 327 mm., wing 133, tail 180, culmen 31, basal width of bill 9, basal depth of bill 10, maxilla from nostril, 18, tarsus 29, middle toe 19.7.

One specimen was obtained at Chatham Bay, Cocos Island, June 30. No others were seen. Two specimens were secured by Townsend and one by the collectors of H. M. S. *Sulphur*.

Genus *Nesotriccus* Townsend.

Nesotriccus TOWNSEND, Bull. Mus. Comp. Zool., XXVII, p. 124, 1895.

“Allied to *Eribates* of the Galapagos Islands, but with bill rela-

tively longer and more flattened. Culmen separating the nostrils as a prominent ridge. Gonys less than half the length of lower mandible, terminating in advance of nostrils. Tail relatively shorter." (Townsend.)

NESOTRICCUS RIDGWAYI Townsend.

Nesotriccus ridgwayi TOWNSEND, Bull. Mus. Comp. Zoöl., xxvii, p. 124, 1895 (Cocos Island).

Range.—Cocos Island.

Adult (sex unknown).—Cat. No. 5054, Stanford University Museum, from Cocos Island, June 30, 1899. Above dusky-olive, becoming pale rufous on the upper tail coverts, a tinge of the same color on the hind neck. Tail feathers brown with buffy edgings and fading into buff terminally. Middle and greater wing coverts with wide, pale rufous tips. Wing quills dusky brown with buff edgings, the latter widest on the secondaries. Below much lighter olive than above, darkest across the breast, pale and yellowish on the belly, becoming buff on the crissum. Throat whitish. Under wing coverts yellowish-olive. Upper mandible dark brown, lower mandible light brown, darker at tip. Feet black. Length 145 mm., wing 58, tail 52, culmen 16, depth of bill at nostril 4, maxilla from nostril 10.5, width of bill at base 6, tarsus 19, middle toe 9.5.

This species, according to Townsend, is "distinguished from the allied *Eribates* (*Myiarchus*) *magnirostris* in having no trace of rufous on inner webs of tail feathers, and no ashiness of throat and breast. It is also smaller with the nostrils separated by a sharp ridge."

CHELIDON ERYTHROGASTER ?

One individual seen flying over Clipperton Island in November.

COCORNIS AGASSIZI Townsend.

Cocornis agassizi TOWNSEND, Bull. Mus. Comp. Zoöl., xxvii, No. 3, p. 123, 1895 (Cocos Island).

Range.—Cocos Island.

Adult Male.—Cat. No. 5058, Stanford University Museum, from Cocos Island, June 30, 1899. Uniform, almost glossy, black except the under tail coverts which are tipped with buffy-gray. Primaries and secondaries brownish-black on inner webs, rectrices dusky-brown below. Bill entirely black. Feet blackish-brown.

Immature Male.—Cat. No. 1259, Stanford University Museum, from Cocos Island, June 30, 1899. Above sooty-black on the central parts of the feathers, the feathers of the head with very narrow buffy

margins, the feathers of the back, scapulars, rump and the upper tail coverts with wider, and the greater and middle wing coverts with very wide, buffy, almost rufous, margins. Rectrices sooty-brown, with very narrow edgings and wider tips of buff. Feathers of lower parts blackish-brown centrally with wide ashy margins on the throat, and buffy margins on the breast, sides and crissum, and with whitish margins on the belly where the dark central areas of the feathers are almost obscured. Under wing coverts and inner edges of bases of the wing quills whitish. Bill blackish-brown above, pale horn-brown beneath. Feet dark brown.

Young Male.—Cat. No. 1401, Stanford University Museum, from Cocos Island, June 30, 1899. Similar to the last, but the pale edges of the feathers of the back wider and olive-buff in color, this color almost obscuring the black central areas of the feathers in the middle of the back. Below, ground color almost uniform pale olive-yellowish; the breast streaked with dark brown. Sides and flanks washed with buff. Upper mandible dark brown, lower mandible brownish toward tip, yellowish at base.

Immature Female.—We have two females in the plumage described by Townsend as adult females, which plumage is exactly the same as that of the "young" male just described. These female specimens certainly have the appearance of being immature birds, having the upper mandible very pale brown and the lower pale yellowish. If these are not mature, then the adult female is not known. It will probably be found to resemble in plumage the "immature" male described above, and to have the bill entirely black, as is the case with the females of the Galapagos genus *Geospiza*.

The collection contains 5 specimens, being 1 adult male, 2 immature males and 2 immature females, all taken on Cocos Island, June 30, 1899. Measurements of the 2 adult males are given below.

MEASUREMENTS, IN MILLIMETERS, OF *Cocornis ridgwayi*.

| Catalogue Number. | Sex. | Length. | Wing. | Tail. | Culmen. | Depth of Bill at Base. | Width of Bill at Base. | Tarsus. | Middle Toe. |
|-------------------|-------|---------|-------|-------|---------|------------------------|------------------------|---------|-------------|
| 5046 | Male. | 127 | 69 | 43 | 14 | 6.5 | 5.7 | 19.5 | 13 |
| 5058 | Male. | 128 | 67 | 42 | 14.5 | 7 | 6 | 21 | 14.5 |

DENDROICA AUREOLA Gould.

Dendroica aureola GOULD, Zoöl. Voy. Beagle, III, Birds, p. 86, 1841 (Galapagos).—TOWNSEND, Bull. Mus. Comp. Zoöl., XXVII, No. 3, p. 122, 1895 (Cocos Island).—RIDGWAY, Proc. U. S. Nat. Mus., XIX, p. 493, 1896.—ROTHSCHILD AND HARTERT, Novitates Zoölogicæ, VI, p. 147, 1899.

Range.—Cocos Island, Galapagos Islands, west coast of Colombia.

We have three immature specimens, one male and two female, all taken from Cocos Island, June 30, 1899. They are indistinguishable from Galapagos specimens of *Dendroica aureola* in corresponding plumage. Townsend, also, could not separate his specimens from Galapagos specimens. *D. aureola* is said by Townsend, Ridgway and Rothschild and Hartert to be very closely related to *D. petechia* of Jamaica.

MEASUREMENTS, IN MILLIMETERS, OF *Dendroica aureola*.
(IMMATURE SPECIMENS.)

| Catalogue Number. | Sex. | Length. | Wing. | Tail. | Culmen. | Width of Bill at Base. | Tarsus. | Middle Toe. |
|-------------------|---------|---------|-------|-------|---------|------------------------|---------|-------------|
| 5056 | Female. | 145 | 61.5 | 50.5 | 12 | 5 | 20.5 | 11 |
| 5210 | Female. | 146 | 65 | 52 | 12 | 4.5 | 20 | 11.5 |
| 5211 | Male. | 145 | 62 | 50 | 12 | 4.5 | 20 | 12 |

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SEPTEMBER 30, 1902.

PAPERS FROM THE HOPKINS STANFORD GALA-
PAGOS EXPEDITION, 1898-1899.

XII.

ECHINODERMATA.

BY HUBERT LYMAN CLARK.

PROFESSOR OF BIOLOGY, OLIVET COLLEGE, MICHIGAN.

CONTENTS.

| | |
|---|-----|
| Introduction | 521 |
| Asteroidea | 522 |
| Ophiuroidea | 524 |
| Echinoidea | 526 |
| Holothurioidea | 527 |
| Comparison of Galapagos and Bermuda Echinoderms | 528 |
| The Holothurians of Clipperton Island | 530 |

INTRODUCTION.

ALTHOUGH the collection of Galapagos echinoderms made by the Hopkins Stanford Expedition is small, and contains no new species, it nevertheless adds something to our knowledge of the marine fauna of those islands. Most of the specimens were collected in shallow water at Tagus Cove, on the west side of Albemarle Island, or at Iguana Cove, at the southwest end of the same island. A few brittle stars were taken at Narboro. A few species were collected only with the dredge, in Tagus Cove. Previous knowledge of the Galapagos echinoderms has been very scanty, for although a number of collecting expedi-

tions have visited the islands, little attention was given to the shallow-water fauna. The *Hassler* expedition collected a few species in 1872, and the *Albatross* visited the islands in 1888, and again in 1891. Most of the latter's collecting, however, was with dredge or trawl in deep water. References to the marine fauna of the islands are comparatively few, and are widely scattered in the literature of marine zoölogy, but it appears that up to the present time 3 species of crinoids (*Calamocrinus diomedæ* A. Ag., *Antedon agassizii* Hartlaub, and *Antedon bigradata* Hartlaub, all collected by the *Albatross* in deep water), 5 species of Asteroids, 8 of Ophiuroids, 12 of Echinoids and 3 of Holothurians have been reported from the Galapagos. It is probable that of these 31 species, not less than 7 are incorrectly reported or are not valid species. The Hopkins Stanford collection contains 146 specimens, representing 24 species; 9 Asteroids, 4 Ophiuroids, 8 Echinoids and 3 Holothurians. Of these, 7 star fishes, 1 brittle star, 3 sea urchins and 1 holothurian, 12 species in all, were not previously known from the islands, so that the Hopkins Stanford Expedition has increased our knowledge of Galapagos echinoderms at least 50 percent.

In the following pages special note is made of any peculiarities of size, color or other characters, in which the Galapagos specimens differ from those from other localities. The previously known geographical range of each species is also added, to show how much that range has been extended by their occurrence at the Galapagos. For the pleasure of examining the collection, I am indebted to Mr. R. E. Snodgrass, by whom it was sent to me.

ASTEROIDEA.

Luidia bellonæ Lütken.

There is a single dry and much broken specimen of a *Luidia* from Tagus Cove, which answers well to the description of this species, except that the paxillæ have more than twelve papillæ. The ray is 100 mm. long, and the color dull yellow marked above with olive green much as in *L. alternata*. The species has been previously reported from Panama, Guayaquil and Callao.

Luidia columbiæ (Gray).

There are two large dry specimens of a *Luidia* from Tagus Cove.

These agree well with Verrill's description of *L. tessellata*, which Sladen considers a synonym of *columbiae*. One specimen has rays 215 mm. long and the other 170 mm. The color is dull bluish or greenish above, and yellow beneath. In the larger specimen one of the granules on the paxillæ is often much larger than the others, and rather spine-like. This species is known from various points along the western coast of Mexico and Central America from San Blas to Panama.

Pentaceros occidentalis (Verrill).

The rays are 140 mm. long, and $R:r = 2.15:1$. One large specimen was taken at Tagus Cove; is also found on the western coast of Mexico and Lower California.

Nidorellia armata (Gray).

The collection contains thirteen dried specimens of this species, all from Tagus Cove. The largest is 122 mm. across, the smallest 90. There is great diversity in the number of spines and marginal plates; one specimen has only 60 superior marginal plates, while all the rest have from 70 to 74. In one specimen every superior marginal plate bears a stout spine, while in another there are only eleven such spines altogether. Common on the Pacific Coast, from southern California to Ecuador.

Paulia horrida Gray.

There are 5 dried specimens, collected at Tagus Cove in from 5 to 50 feet of water. The largest has rays 66 mm. long. Also known from the coast of Ecuador.

Pharia pyramidata (Gray).

Of this species there are 5 dry specimens from Tagus Cove, and 1 alcoholic from Iguana Cove. The largest has rays 180 mm. long. Previously known from the west coast, from Margarita Bay to Colombia.

Phataria unifascialis (Gray).

One dry specimen from Tagus Cove, with rays 98 mm. long. Has been collected along the coast from Margarita Bay to Zorritas, Peru.

Heliaster cumingi (Gray).

Of this curious starfish, there are 6 dry specimens from Tagus Cove and one alcoholic specimen from Iguana Cove; one has 32, one has 33, two have 34, one has 35, one has 36, and one has 37 rays; the last is the largest, about 140 mm. across. $R:r = 7:6$. Color purplish black above, with pale yellow spines, and on the oral surface dirty yellowish. Easily distinguished from the following species, not only by its color, but by the very short rays, and numerous equal

spines. Previously reported from Peru and also from Hood and Chatham Islands in the Galapagos.

***Heliaster multiradiata* (Gray).**

There are 2 specimens in alcohol from Iguana Cove, one with 21 and one with 25 rays, and 2 dry specimens from Tagus Cove, one with 23, and one with 26 rays; the last is the largest, about 170 mm. across. $R:r = 7:4$. The alcoholic specimens are, on the aboral side, blue-black marked with pale yellow; spines yellow; oral side pale dirty brown. The dry specimens are yellow, irregularly marked with black; oral side yellow, but the basal half of the adambulacral spines, and the oral spines, are black. Previously reported from the Hawaiian Islands, California, Mexico and the Galapagos Islands.

The following Asteroids have been previously reported, but all are of questionable standing and are therefore not counted as properly belonging in this list. *Culcita schmideliana* (Retzius).

A species of the western Pacific and the Indian Oceans, reported by Gray from the Galapagos, but perhaps his specimen was incorrectly labelled.

Gymnasterias valvulata Perrier.

A species based on a young individual which may be a young *Nidorcellia* or possibly an immature *Gymnasterias carinifera*, a well-known Panama species.

Ancanthaster ellisii (Gray)

Another western Pacific species, the occurrence of which at the Galapagos is probably based on an incorrectly labelled specimen.

OPHIUROIDEA.

***Ophiura teres* Lyman.**

The collection contains a single dry specimen from Narboro Island. It is notable for its large size, the disc being 35 mm. in diameter, and the rays 135 mm. long. The disc is closely and uniformly granulated, the radial and oral shields being completely concealed. The arm spines are 12 for some distance out on the arm, and the upper arm plates are often broken into 2 pieces, or less commonly 3, or even 4, but some are unbroken. This species is known from Lower California, from the west coast of Central America, and was taken at the Galapagos Islands by the *Hassler* Expedition.

***Ophionereis albomaculata* E. A. Smith.**

Of this species, peculiar to the Galapagos, the collection contains one dry specimen from Narboro, and 22 alcoholic specimens from Iguana Cove. There are always four arm-spines for some distance out on the arms, and in one specimen five. Color somewhat variable; in the dry specimens olive-green marked with yellowish-white, especially on the upper arm-plates; in the alcoholic specimens, the prevailing tint is

brown, but in some specimens the upper side of the disc is light; in one specimen pale yellowish-white; in the smallest specimens, the upper side of the arms is more or less clearly banded with dull purplish, brownish-olive, and yellowish. The largest specimen has the disc 16 mm. across, and arms 105 mm. long; the smallest is 7 mm. across, and has arms 45 mm. long. Easily distinguished from any of its near relatives by its color and arm-spines.

Ophiocoma æthiops Lütken.

Of this huge species, the collection contains a single dry specimen from Narboro and five alcoholic specimens from Iguana Cove. The dry one is the largest ophiuran known to me, the disc being 40 mm. in diameter; unfortunately all the arms are broken. It resembles the common West Indian species, *O. echinata*, superficially, but is easily distinguished by its finer disc granulation, the wider arms, and the difference in shape of the oral shields and upper arm plates. Previously reported from Lower California and the west coast of Central America; it was collected at the Galapagos by the *Hassler* Expedition.

Ophiothrix spiculata LeConte.

There are two dry specimens from Narboro and three alcoholic from Iguana Cove. The disc of the largest one is 12 mm. across and the arms less than 50 mm. long. The diversity of color is very remarkable. One of the dry specimens is dark purplish-blue, with the under arm-plates marked with yellowish-white, and the arm-spines dark dull purple. The other has the disc and basal half of arms yellowish, the center of disc, interbrachial spaces, and upper arm-plates clouded with dark blue; the arm-spines are light and clear, and just tipped with purple; the terminal half of the arms is dark blue as in the first specimen and the transition from yellow base to blue tip is very abrupt. The alcoholic specimens are intermediate in color between these two, but approach much more nearly the dark one. This also is a western Central American species.

The following species previously taken at the Galapagos, are not in the Hopkins Stanford collection.

Ophionereis annulata Lütken.

A western Central American species.

Ophionereis nuda Lütken and Mortensen.

Collected near Chatham Island by the *Albatross*, and not known from any other station.

Amphiura verticillata Ljungman.

Peculiar to the Galapagos.

Ophiothrix magnifica Lyman.

A western Central American species.

The brittle star which Lütken and Mortensen describe under the name *Ophiothrix galapagensis* seems to be, without much doubt, the young of *O. spiculata*.

ECHINOIDEA.**Cidaris thouarsii** Valenciennes.

This species, common from Guayamas to Panama and the Pearl Islands, and previously known from the Galapagos, is represented in the collection by 17 specimens, 11 dry ones from Tagus Cove, 1 small one from Narboro, and 5 alcoholics from Iguana Cove.

Diadema mexicanum A. Agassiz.

The collection contains 4 dry specimens, all from Tagus Cove, the largest 100 mm. in diameter and 48 high. Previously known from the Pacific coast from Acapulco to Puget Sound.

Strongylocentrotus gibbosus (Valenciennes).

There are 11 dry specimens of this interesting urchin, from Tagus Cove. They range in diameter from 16 to 40 mm. The color is a distinct reddish-brown, the spines very dark olive, tipped with purplish; specimens from Chile and Peru, whence the species was previously known, are said to be gray. All but the smallest of the shells before me are distorted by the presence of the parasitic crab so generally found in this urchin, and in all but 3 the crab is present. This species has been previously reported from the Galapagos.

Toxopneustes semituberculatus (Valenciennes).

There are 4 dry specimens from Tagus Cove, and 8 alcoholics from Iguana Cove, ranging in diameter from 27 to 50 mm. They agree well with Agassiz's description except in color; the test is light brownish-green, the numerous pedicellariæ purple and the spines bright yellowish-green, less yellow in alcoholic specimens. Previously recorded from Cape San Lucas, Central America and the Galapagos.

Hippocæ depressa A. Agassiz.

There is a single fine specimen of this species, 118 mm. in diameter, from Tagus Cove. Previously reported from the Gulf of California and west coast of Central America.

Clypeaster rotundus A. Agassiz.

There are 5 very handsome dry specimens in the collection, dredged in 50 feet of water in Tagus Cove. All are dull purple in color, but differ considerably in shape; one is 160 × 135 mm. while another is 145 × 138 mm., the largest is 162 × 150 mm. They are easily dis-

tinguished from *C. subdepressus* from Jamaica, by the thicker edge of the test, by the shape of the rosette, and by the shorter, broader and blunter petals. This species occurs along the coast from San Diego to Acapulco.

Encope micropora Agassiz.

There are 7 fine, large, dry specimens, dredged on the sand in Tagus Cove in 50 feet of water. They vary considerably in proportions, one being 138×125 mm. and another 142×140 mm., the largest is 152×148 mm. The color is light brown, the margin and edges of the lunules dark purple. This species occurs from Guayamas to Panama, and has been previously reported from the Galapagos.

Rhynchopygus pacificus A. Agassiz.

The most beautiful object in the collection is a nearly perfect test of this spatangoid, $70 \times 58 \times 30$ mm., bleached perfectly white. There are two other broken tests. This species is known from Panama, Acapulco, and Cape San Lucas, and has been previously reported from the Galapagos.

The following echinoids have been previously taken at the Galapagos :

Arbacia stellata (Blainville).

An urchin, ranging from Puget Sound to Peru.

Mellita stokesii Agassiz.

A sand dollar, known from Punta Arenas, Panama and Guayaquil.

The *Albatross* took two other species (*Porocidaris cobosi* A. Ag. and *Salenia miliaris* A. Ag.) in deep water in the vicinity of the islands, but they are not littoral forms, and so are not listed here.

The following species are reported from the Galapagos, but the first is of doubtful standing, and the other two are Western Pacific species, whose occurrence in the Galapagos is more than doubtful :

Pleurechinus bothryoides Agassiz.

Amblypneustes formosus Valenciennes.

Strongylocentrotus tuberculatus (Lamarck).

HOLOTHURIOIDEA.

Holothuria fusco-rubra Théel.

Of this species, previously known only from the Hawaiian Islands, there are two good specimens from a reef near Tagus Cove. They are about 125 mm. long, light reddish-brown, and answer perfectly to Théel's description and figures, except for some minor differences in the supporting plates of the pedicels.

Holothuria impatiens (Forskal).

The collection contains 3 much contracted specimens, from 60 to 120 mm. in length, of this almost cosmopolitan species, collected at Tagus Cove. The Galapagos specimens are distinguishable at a glance from those from the West Indies, which also seem to answer the description, and I feel reasonably sure that the specimens from the Caribbean, which have been referred to this species, are really perfectly distinct. The Galapagos specimens seem to resemble the East Indian form. They are brownish-gray, with large papillæ, many of which are almost white. The skin is very rough. Théel has reported this species from Charles and James Islands, in the Galapagos.

Holothuria marenzelleri Ludwig.

There are eleven specimens from the reef near Tagus Cove, which agree admirably with Théel's description of specimens from Charles and James Islands. This species was originally described from Nangkauri, and may therefore be regarded as an East Indian form. The individuals before me are from 60 to 100 mm. long, and have a stone-canal 25 to 30 mm. long.

The only other holothurian known from the Galapagos is

Holothuria arenicola Semper.

An East Indian species collected by the *Hassler* expedition.

COMPARISON OF GALAPAGOS AND BERMUDAN ECHINODERMS.

It is interesting to compare the Galapagos fauna with that of the Bermudas, since the latter islands are similarly isolated from the mainland. Leaving out of account the crinoids and deep water forms, 40 species of echinoderms are known from the Bermudas, and only 31 from the Galapagos. The four classes are represented as follows:

| | Asteroids. | Ophiuroids. | Echinoids. | Holothurians. | Total. |
|-----------|------------|-------------|------------|---------------|--------|
| Bermudas | 4 | 18 | 8 | 10 | 40 |
| Galapagos | 9 | 8 | 10 | 4 | 31 |

Viewed thus, the most interesting differences between the two faunæ are to be found among the Asteroids and Holothurians. Starfishes are noticeably uncommon in the Bermudas, while they are very common in the Galapagos; exactly the reverse conditions exist among the Holothurians. In the latter case, however, the real explanation may lie in our imperfect knowledge, for Holothurians are easily overlooked, and, even when found, are difficult to preserve, so that few

would be brought home from the Galapagos unless they were specially sought for. As regards Ophiuroids, it is only by very recent and diligent search that such a large number of species has been found at the Bermudas. It is highly probable that similar diligent search would largely increase the number of species from the Galapagos.

By comparing the faunæ of the two regions, with respect to the origin of the Echinoderms, it appears that the Bermudan species are chiefly West Indian, while the Galapagos species are South American, with a few noteworthy exceptions :

| Bermudas. | | | | | Galapagos. | | | | |
|--------------------------|-------------|--------------|-------------|----------------|--------------------------|-------------|--------------|-------------|----------------|
| | Aster-oids. | Ophiu-roids. | Echin-oids. | Holo-thurians. | | Aster-oids. | Ophiu-roids. | Echin-oids. | Holo-thurians. |
| West Indian. | 3 | 18 | 8 | 7 | Central and S. American. | 9 | 5 | 10 | — |
| Northern or E. Atlantic. | 1 | — | — | 2 | Pacific and East Indian. | — | — | — | 4 |
| Local. | — | — | — | 1 | Local. | — | 3 | — | — |

The most important point, brought out by this table, is that the holothurians of the Galapagos have apparently had an entirely different origin from the other echinoderms. Only one of the four species (*H. impatiens*) has been reported from east of the islands and that record (Panama) is open to suspicion; but even if correct, it does not alter the fact that the species is an oriental one. This peculiar difference between the holothurians and other echinoderms offers considerable opportunity for speculation. For example, the question arises whether it indicates that holothurian larvæ are more hardy than those of the other classes, and that they alone survived the long journey across the Pacific; and having once become established in the Galapagos, have they crowded out or kept out American species, which must have been brought there along with the larvæ of other groups? Only a thorough study of the holothurians of all the islands of the Archipelago, and of the whole Pacific coast of tropical America, can answer these questions, for it is entirely possible that this apparent peculiarity in the echinoderm fauna of the Galapagos may be due simply to our ignorance of Pacific holothurians. These 4 species may prove to be very widely ranging species, occurring on the American coast also, and if that is so, their occurrence in those islands is not so remarkable. But it is curious that no American holothurians have yet been found in the Galapagos. In this connection, it is interesting to note that in the Bermudas 3 holothurians occur, which are not West Indian, while there is only one other echinoderm of which this is true.

Another point shown by the table is that while the Bermudas have among their 18 known species not one peculiar ophiuroid, the Galapagos, with less than half as many species, have three peculiar forms. This may illustrate, what there is some reason to believe is the case, that the ophiuroids are more variable than any other class of echinoderms, and that "new species" are now forming under the influence of isolation or other suitable conditions, more rapidly than in the other classes. Or it may simply emphasize the fact that our knowledge of West Indian ophiuroids is far in advance of our knowledge of eastern Pacific forms. But whatever the explanation, these facts, though so few, seem worthy of special note.

THE HOLOTHURIANS OF CLIPPERTON ISLAND.

With the echinoderms from the Galapagos, Mr. Snodgrass sent me 26 holothurians taken at Clipperton Island. This island lies in latitude 10° north, and near longitude 109° west. It is the easternmost of the Pacific coral islands. These holothurians represent only two species, nine of them being large black individuals, the others small and reddish-brown. The former answer well to the descriptions of *Holothuria atra* (Jäger), especially as regards the calcareous deposits, but the specimens do not look at all like Semper's figure nor do they resemble specimens from the West Indies, with similar calcareous bodies. At present, however, there seems to be no recourse but to call them *H. atra*, though I am confident that no less than three distinct species are now included under that name. The case is very similar to that of *H. impatiens* and like that will require an abundance of material from all parts of the globe to make a proper assortment possible. The small holothurians from Clipperton Island seem to represent a new species allied to *H. captiva* Ludwig and *H. difficilis* Semper, the former from the West Indies, the latter from Samoa. For this species I propose the name *Holothuria frequentiamensis*.

HOLOTHURIA FREQUENTIAMENSIS sp. nov.

Dorsal surface somewhat arched, sparsely covered with papillæ; ventral surface flat, closely covered with pedicels, which show no evidence of arrangement in longitudinal rows; line between dorsal and ventral surfaces quite clearly marked. Tentacles 20, not peculiar. Polian vessels, 3 or 4. Stone-canal small, single. Calcareous ring not peculiar, similar to that of *H. captiva*. Cuvier's organs very noticeable, brownish or purplish (in alcohol). Reproductive organs wanting in all but one specimen; some had evidently eviscerated while

others were probably immature. In the one specimen, they were very small but seemed to be present only on the left side of the mesentery. Calcareous deposits, very regular tables, the bases perforated by a central, and 8 or 9 peripheral holes, the rather low spires surmounted by 20-30 teeth; underneath the layer of tables are numerous buttons, most of which are not symmetrical, and have 8-12 holes, though many have only six; in and about the pedicels the buttons increase in size and gradually become transformed into curved supporting plates with four or more longitudinal series of holes; in the papillæ, are curved, rough supporting rods; the holes in the buttons and plates are not large nor of uniform size, but are quite irregular. The tables are very closely crowded in the outer layer of the body wall so that they form a rough, crisp layer, though very delicate, over the whole surface; it is because of this that the name *frequentiamensis* has been selected. Color light brown, with a distinctly reddish tinge; the tentacles and pedicels darker. Length of largest specimen about 40 mm.

Although this species is undoubtedly closely related to *captiva* and resembles it in some respects, it is distinguished from that species by the shape and arrangement of the calcareous particles, especially the buttons. In these respects also it differs from *difficilis* although it may be even nearer this latter species. Semper's description is very brief and he gives the figure of only one table and two buttons, so it is possible the Clipperton Island specimens are really nearer those from Samoa than would appear from the descriptions. But they differ in size, color and number of Polian vessels, as well as in the calcareous particles. Moreover, the genital gland is attached to the dorsal mesentery near the middle of the body in *frequentiamensis*, and not close behind the calcareous ring as Semper says it is in *difficilis*.

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THE EYES OF RHINEURA FLORIDANA.

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PROFESSOR OF ZOÖLOGY, INDIANA UNIVERSITY,

CONTENTS.

| | |
|--------------------------------------|-----|
| Introduction | 533 |
| Habits of Rhineura | 534 |
| General Account of the Eye | 535 |
| Minute Anatomy of the Eye | 537 |
| (a) The iris | 537 |
| (b) The vitreous body | 538 |
| (c) The lens | 538 |
| (d) The retina | 538 |
| Conclusions | 540 |
| Acknowledgments | 541 |
| Bibliography | 541 |

INTRODUCTION.

THIS paper is the fourth of a series on the Eyes of Blind Vertebrates of North America, and the forty-third contribution on zoölogical topics emanating from the Zoölogical Laboratory of Indiana University. It is one of the reports of a committee of the American Association for the Advancement of Science on the Investigation of the Cave Fauna of North America, a committee of which Theo. N. Gill is chairman, the author secretary, and A. S. Packard, C. O. Whitman, S. H. Gage, and H. C. Bumpus, the other members. The researches on which this report is based were assisted by grants from the American Association for the Advancement of Science. The three preceding reports on this subject are as follows:

Proc. Wash. Acad. Sci., Sept., 1902.

1889. I. The Eyes of *Amblyopsidæ*. Arch. f. Entwicklungsmech., VIII, pp. 545-617, plates XI-XV.
1900. II. The Eyes of *Typhlomolge rathbuni* Stejneger. Trans. Am. Microsc. Soc., XXI, pp. 49-60, plates III and IV.
1900. III. The Structure and Ontogenic Degeneration of the Eyes of the Missouri Cave Salamander. Biological Bulletin, II, pp. 33-40, plate.

HABITS OF RHINEURA.

Rhineura floridana Baird is a legless, burrowing, blind Amphisbænian lizard. It is abundant in some parts of Florida. The largest individual I secured measured 340 mm. The tail is very short, flattened dorsoventrally, and the upper surface of its distal half is strongly rugose. Each of the transverse rings is here, with numerous tubercles. The mouth is small; the tip of the lower jaw is some distance behind the tip of the upper jaw. In shape, color and arrangement of its dermal plates it strikingly resembles an earthworm. This resemblance is heightened by its vermiform progression through the rhythmic movements of its annular plates. Its forward and backward locomotion in its burrows is entirely due to this vermiform movement. It burrows rapidly, and for this its small, hard, conical head is well adapted. The point of the snout is turned down and the head then thrust upward in a rooting fashion. An individual will readily disappear in from half a minute to two minutes. By placing it in a glass vessel partly filled with earth its burrowing can readily be seen from below. If placed on a bare surface it for a time will wriggle actively from side to side, snake fashion, but without much effect as far as locomotion is concerned. The tail, under such circumstances, is dragged behind, as if it had no vital connection with the head. Rarely there is a suggestion of a bracing with the tip of the tail against the floor. In one minute an individual moved 250 mm. In an attempt at rooting, after the snout had become wedged under the edge of an immovable object, the whole body to the tip of the tail was repeatedly lifted off the floor.

Rhineura is, as far as I know, one of the two blind vertebrates that have been found in the fossil state. Baur described a species of *Rhineura* (*R. hatcherii*) and another Amphisbænian (*Hypsorhina antiqua*) from the Miocene beds of South Dakota. Baur says nothing concerning the dermal plates, so that nothing is definitely known about the eyes of this fossil *Rhineura*. Since all the genera of the family Amphisbænidæ have rudimentary eyes, the eyes were very probably degenerate before the genera became separated. It seems quite cer-

tain that any fossil members of an existing genus all of whose living species have degenerate eyes, must have had eyes that were to a greater or less extent degenerate. The time suggested by this find of Baur during which the eyes of *Rhineura* have been degenerating is surprisingly long, extending as it does through about 5 to 10 percent of the formation of sedimentary rocks. This is in distinct contrast to the Amblyopsidæ, the family of blind fishes, in which the eyes have reached their present condition largely since the glacial epoch, during which the caves of the Ohio valley were not habitable. The eyes of the latter were, however, very probably degenerate to a certain degree before they entered the caves.

Rhineura is a burrowing animal, and blind animals which burrow in the ground are not found in naturally made caves. The latter are largely populated by species that tend to hide in crevices or natural cavities under rocks. It would seem from this that the cave fauna was incipient before the existence of caves, and that the latter were colonized as soon as they were large enough to admit their present inhabitants.¹

GENERAL ACCOUNT OF THE EYE.

The eye of *Rhineura floridana* is not visible externally, nor is there any indication where it formerly came to the surface. The side

¹ I have in divers other places emphasized the fact of the voluntary colonization of caves by animals predisposed to shun the light or creep under rocks or into crevices. In other words, the predisposition to become cave animals existed before the present caves were formed. There is no doubt whatever that the colonizers have been profoundly modified since they entered the caves. Ernest Krause (Prometheus, ix, 652) enters the following protest:

"Well, whoever believes it may also attain blessedness in the belief that caves were created to serve as the playground and elysian fields, as it were, of the blind of all classes of animals. We have repeatedly heard these siren songs out of the mystic darkness of the enemies of light and of the development theory; they are in harmony with the growing effort to upset Lamarckism, Darwinism and even Weissmannism, and hence, before we admit the convincing force of Eigenmann's conclusions, we must look a little more closely at their foundations."

Mr. Krause continues for another column to show how very wrong it is not to agree with him that the degeneration of the eyes of cave creatures is due to the absence of light. It is, however, necessary to get our animals into the caves before their eyes may degenerate as the result of the absence of light, and they must be able to maintain themselves in the dark after we have got them there. A sudden and accidental colonization is, therefore, out of the question. If species depending on their eyes for food are excluded as candidates for cave existence, nocturnal animals, negatively heliotropic or positively stereotropic ones, must have supplied the present cave fauna. An examination of the inhabitants of any cave will readily demonstrate that its fauna was derived from the latter classes and that, in spite of the absence of light, many of them have not yet undergone any appreciable degeneration as far as their eyes are concerned.

of the head is continuously covered with plates. There are four labials (1, 2, 3 and 4, of fig. 22), the posterior of which is comparatively large. Above the labials from in front backward lie a single nasal (5), a single loreal (6), a single preorbital (7), and a group of temporals (8). Above this series of plates lie a supranasal (9), joined to its fellow of the other side, a prefrontal (11) and two supraciliaries (12, 13). In heads cleared with xylol the black eye can be seen to

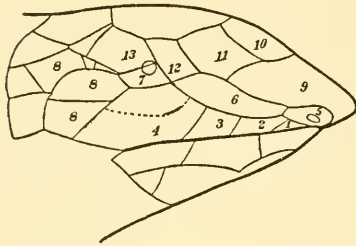


FIG. 22. Side view of head of *Rhineura* showing surface plates and position of eye in relation to them.

lie underneath the angle between the two supraciliaries and the preorbital.

The dermis and epidermis over the eye are not different from these structures over neighboring regions except that in one instance (Pl. xxxii, fig. 3, *dt*) a solid column of cells $32\ \mu$ thick extends from Harder's gland to near the epidermis, without however fusing with the latter. Fisher (1900, p. 470) found that in *Trogonophis* the epidermis is reduced to half its thickness and free

from pigment over the eye. In *Amphisbæna strauchi* and *A. darwini* the skin is not thinner and the pigment is little or not at all less over the eye. A conjunctival sac has been described for various Amphisbænians. No such structure is present in *Rhineura*.

Harder's gland (Pl. xxxii, figs. 2 and 3, *HGl.*) is out of all proportion to the size of the eye. In a horizontal section it measures about four times as long as the eye (medio-laterally) and three times as wide (antero-posteriorly). Duvernoy found that in *Typhlops* Harder's gland is ten times as great as the eye. It is divided into two distinct lobes, that over the anterior face of the eye is histologically quite different from that over the posterior face. In vertical section the gland is seen to entirely surround the eye except sometimes at its lower posterior quarter. The large size of Harder's gland has given rise (Duvernoy) to the conclusion that its function is not connected with the eye. Its secretion is poured directly into the tear duct and through it into the nasal cavity.

The distance of the eye beneath the outer surface of the epidermis measures between 320 and 560 microns in specimens between 280 and 310 mm. long. It is surrounded by two layers of connective tissue. These are thin over the distal half of the eye. Over the proximal narrow end of the eye they become thick and since they are prolonged

beyond the eye, stain a different tint and readily become separated, they are easily distinguishable. They probably represent the sclera and choroid. If so the choroid is practically free from pigment except possibly in rare instances where a few pigment granules were detected in cells closely applied to the eye. There is no indication of any differentiation into a cornea or capsule of any sort. The fibrous sheaths are at the proximal end drawn out into a cone. A supposed scleral cartilage has been found in one individual. Here a bar about $20\ \mu$ thick extends from over the center of the distal face of the eye for $160\ \mu$ around its posterior face. It stains and has the structure of bone rather than of cartilage.

No traces of any muscles have been found connected with the eye.

The eye is directed outward and forward. Its axis is horizontal and makes an angle of about 60° with the sagittal plane of the body. It does not occupy a definitely fixed position on its axis. In the eye of one side the choroid fissure was found directed caudad, in the other eye ventrad. It is irregularly pear-shaped, with its anterior face convex, its posterior face flat or even concave. The eyes in three specimens give the following measurements in microns:

MEASUREMENTS IN MICRONS OF EYES OF RHINEURA.

| Length of Specimen. Millim. | Medio-lateral Diameter. | | Antero-posterior Diam. | | Distance from Surface. | |
|--------------------------------|-------------------------|------------|------------------------|------------|------------------------|------------|
| | Left Eye. | Right Eye. | Left Eye. | Right Eye. | Left Eye. | Right Eye. |
| 275 | 320 | 320 | 128 | 176 | 480 | 336 |
| 280 | 312 | 298 | 160 | 181 | 320 | 368 |
| 310 | 320 | 320 | 216 | 176 | 560 | 560 |

MINUTE ANATOMY OF THE EYE.

All the structures vary greatly in different eyes so that the terms "sometimes," "usually," frequently," etc., have to be used much more than is desirable. This cannot be avoided unless each eye is given a distinct description.

(a) *The Iris*.—In the structure of the irideal region the eye of this species is unique among the degenerate vertebrate eyes so far described. In all other eyes, with the possible exception of *Troglichthys*, elements of an iris are distinctly recognizable. In *Rhineura* the fold of double epithelium between the pigmented and unpigmented part of the retina whose margin is the margin of the pupil has been obliterated and the pupillary edge forms the extreme outer edge of the blunt end of the pear (Pl. XXXIII, fig. 1, *p*). The pigmented layer of the retina in

other words merges directly into the unpigmented layers of the retina. The entire thickness of the retina is thus exposed at the distal face of the eye.

(b) *The Vitreous Body*.—The vitreous cavity is represented by a vertical slit extending from the axis of the eye downward to the edge. The choroid fissure (Pl. xxxiv, fig. 4, *Chr.f.*) thus remains permanently open in so far as the edges of the opposite sides of the fissure are not united. In one eye a space a few microns wide was found in the eye. In other cases there is no real cavity and no vitreous body. The hyaloid membrane (Pl. xxxiii, fig. 1 and Pl. xxxiv, fig. 4, *hd*) is represented by a few cells with elongated nuclei. Blood vessels were not found in it.

(c) *The Lens*.—In two specimens no traces of a lens were found. In two other specimens a lens was present. There being no pupil and no vitreous cavity the lens is situated in a little depression in the distal face of the retina (Pl. xxxii, fig. 4; Pl. xxxiv, figs. 1, 2, 3). The lenses differ greatly from each other. In the better developed instances (Pl. xxxiv, fig. 1) it is composed of a spherical mass of cells. The nuclei are granular and are surrounded by a hyaline cell body. These little capsules are closely packed in a slightly darker matrix. The whole lens is surrounded by a fibrous capsule containing elongated nuclei. Both eyes of one individual are provided with lenses as described. In another individual the two lenses differ materially not only from those described, but from each other both in structure and size. The left lens consists of a lenticular nodule containing about six dense nuclei (Pl. xxxiv, fig. 2). On the right side (Pl. xxxiv, fig. 3) the lens is much larger. It consists of two large nucleated capsules surrounded by a matrix containing a few dense elongated nuclei similar to those of the capsule surrounding it (Pl. xxxiv, figs. 1, 2, 3 are drawn to the same scale). The difference exclusive of size between the two capsules and the many nuclei represented in Pl. xxxiv, fig. 1, may be due to differences in the method of preparation.

(d) *The Retina*.—The numbers in the following paragraphs are not consecutive, but are those used to designate the corresponding layers in the figures.

1. The pigment epithelium forms a complete outer layer of the eye exclusive of its distal face and a narrow strip along the choroid fissure. The extent to which this epithelium is pigmented differs greatly in different eyes. A region along either side of the choroid fissure is free from pigment, occasionally parts of the anterior face of the eye are free from pigment (Pl. xxxiii, fig. 2) and very frequently the

cells of this layer around the distal margin of the eye are free from pigment. Over the anterior face of the eye this layer is usually composed of a regular layer of cells whether these are free from pigment or not (Pl. xxxiii, figs. 1 and 2). On the posterior face the series of cells is not nearly so regular. The pigmented epithelium is here invaginated and folded upon itself in various ways. The infoldings are sometimes solid masses of pigment cells, but sometimes they form hollow spheres which contain a mass of concentrically arranged unpigmented material, probably of choroidal origin (Pl. xxxii, fig. 6c and Pl. xxxiii, fig. 3). What the significance of these cysts may be I cannot conjecture. Indications of similar structures were in these ne eyes of *Amblyopsis*.

The narrow stalk of the pear-shaped eye is usually filled with an irregular jumble of pigment cells. In favorable sections it is seen that these are also the result of an invagination of the pigment epithelium from the pointed end of the eye (Pl. xxxiii, fig. 2). The pigment epithelium has not been reduced at the same rate as the rest of the retina; as a consequence it is infolded in various ways. Small pigment cells are sometimes found in the inner layers of the retina among the ganglionic cells and along the optic nerve within the eye. Pigment cells were also found in the eyes of *Typhlomolge* (Eigenmann, 1900, figs. 2 and 6, z). There are rarely any pigment cells over the distal face of the eye.

1a. X, nuclei. In the eyes of *Typhlichthys* (Eigenmann, 1899, fig. 44, x, and *Troglichthys*, figs. 52 and 56, ul) I described a few cells with elongated tangentially placed nuclei between the pigmented epithelium and the outer nuclear layer. I was unable to account for these in the eyes of the two fishes mentioned. Similar cells, similarly located, are present in this eye. They are distinctly outside of the outer limiting membrane (Pl. xxxii, fig. 5; Pl. xxxiii, figs. 1, 2). I am at as great a loss to explain the origin of these nuclei as I was those found in *Typhlichthys*. Possibly they are derived from the pigment epithelium which in some of the unpigmented regions (Pl. xxxiii, fig. 2, x) are more than one layer deep. If the outer layer should become pigmented the inner nuclei if they remained unpigmented might give rise to these longitudinal cells.

2. Rods and cones are not present. There is in some cases a distinct space between the pigment epithelium and the outer nuclear layer. This space when present is partially filled with filmy, hazy structures, but nothing suggesting definitely either a rod or cone was detected (Pl. xxxii, fig. 5; Pl. xxxiii, fig. 1).

3. The outer nuclear layer consists of about two series of elliptical nuclei. They form a compact and distinct layer a few microns from the outer limiting membrane (Pl. xxxii, fig. 5; Pl. xxxiii, figs. 1, 2; Pl. xxxiv, fig. 4).

4. The outer reticular layer is represented by a series of distinct but irregular gaps between the outer nuclei and the inner nuclei. Horizontal cells are not present (Pl. xxxii, fig. 5; Pl. xxxiii, figs. 1, 2, 3).

6. The inner nuclei are smaller, rounded and less granular than the outer nuclei. They do not form as compact a layer as the outer nuclei. It is impossible to distinguish between bipolar and spongioblastic cells (6 in the different figures).

8. As is usual with the inner reticular layers in degenerate eyes this layer is well developed in the eyes of *Rhineura*. It is frequently crossed by Müllerian fibers (8 in the figures).

9. The ganglionic layer is represented by a number of nuclei loosely grouped about the vitreous slit. The individual nuclei are distinctly larger than those of the inner nuclear layer and less oval than those of the outer nuclear layer (9 in the figures).

10. A distinct optic fiber layer is not present and the optic nerve is nowhere within the eye a compact strand of fibers. A loose flocculent strand of fibers passes through the proximal part of the retina. Its path through the pigmented layer is difficult to trace. Beyond the eye the optic nerve can be followed in my preparations by means of the fibrous sheaths and pigment cells associated with it (Pl. xxxiii, fig. 4) rather than by the presence of any fibers with a distinctly nervous structure. The optic nerve leaves the eye not at the proximal end or the narrow end of the pear but anterior to the pigment mass in the narrow part of the pear (Pl. xxxiii, fig. 2, *n. op.*).

CONCLUSIONS.

1. The eye of *Rhineura* has reached its present stage as the result of a process of degeneration that probably began in the early Miocene.

2. The dermis and epidermis pass over the eye without any modifications. The conjunctival pocket has vanished.

3. Harder's gland is many times as large as the eye and pours its secretion into the tear duct and thus into the nasal cavity.

4. The eye muscles have disappeared.

5. A cornea is not differentiated.

6. The lens is absent in half the eyes examined and varies greatly in those in which it is present.

7. The vitreous body has practically disappeared.

8. The pigment epithelium is variously pigmented. It is of greater extent than is sufficient to cover the retina and has been variously invaginated or puckered over the proximal and posterior faces of the eye.

9. An uveal part of the iris is not present.

10. The eye of *Rhineura* does not represent a phylogenetically primitive stage; it is an end product of evolution as truly as the most highly developed eye.¹

11. The adult eye shows few indications that there has been a cessation of development at any definite ontogenic stage. It does not resemble as a whole any ontogenic stage.

12. An arrest in the ontogenic development has taken place in so far as the number of cell multiplications concerned in forming the anlage of the various parts of the eye have decreased in number, and in the lack of union of the lips of the choroid fissure.

13. It is possible that the absence of cones or rods is due to an arrest in the histogenesis of the retina but since these structures are normally formed in the young of *Typhlotriton* and disappear with age it is possible that their absence in the adult eye of *Rhineura* is also due to ontogenic degeneration.

14. The irregularity in the structure and existence of the lens and the great reduction of the vitreous body offer evidence in favor of the idea of the ontogenically and phylogenically earlier disappearance of the ontogenically and phylogenically newer structures.

15. Horizontal nuclei found between the pigment epithelium and the outer limiting membrane are probably derived from the proximal layer of the optic cup.

16. The different layers of the retina have reached a degree of differentiation out of proportion to the great reduction of the dioptric apparatus and general structure of the eye.

ACKNOWLEDGMENTS.

My attention was called to this lizard by Mr. W. S. Blatchley, State geologist of Indiana. Dr. W. B. Fletcher, of Indianapolis, kindly secured some specimens for me. To both of these gentlemen I wish to express my obligations. Other specimens were secured through dealers.

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¹ The detailed considerations on which conclusions 10, 11, 12, 14 are based are not presented in the body of this paper. They will, however, be granted no doubt.

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PLATE XXXII.

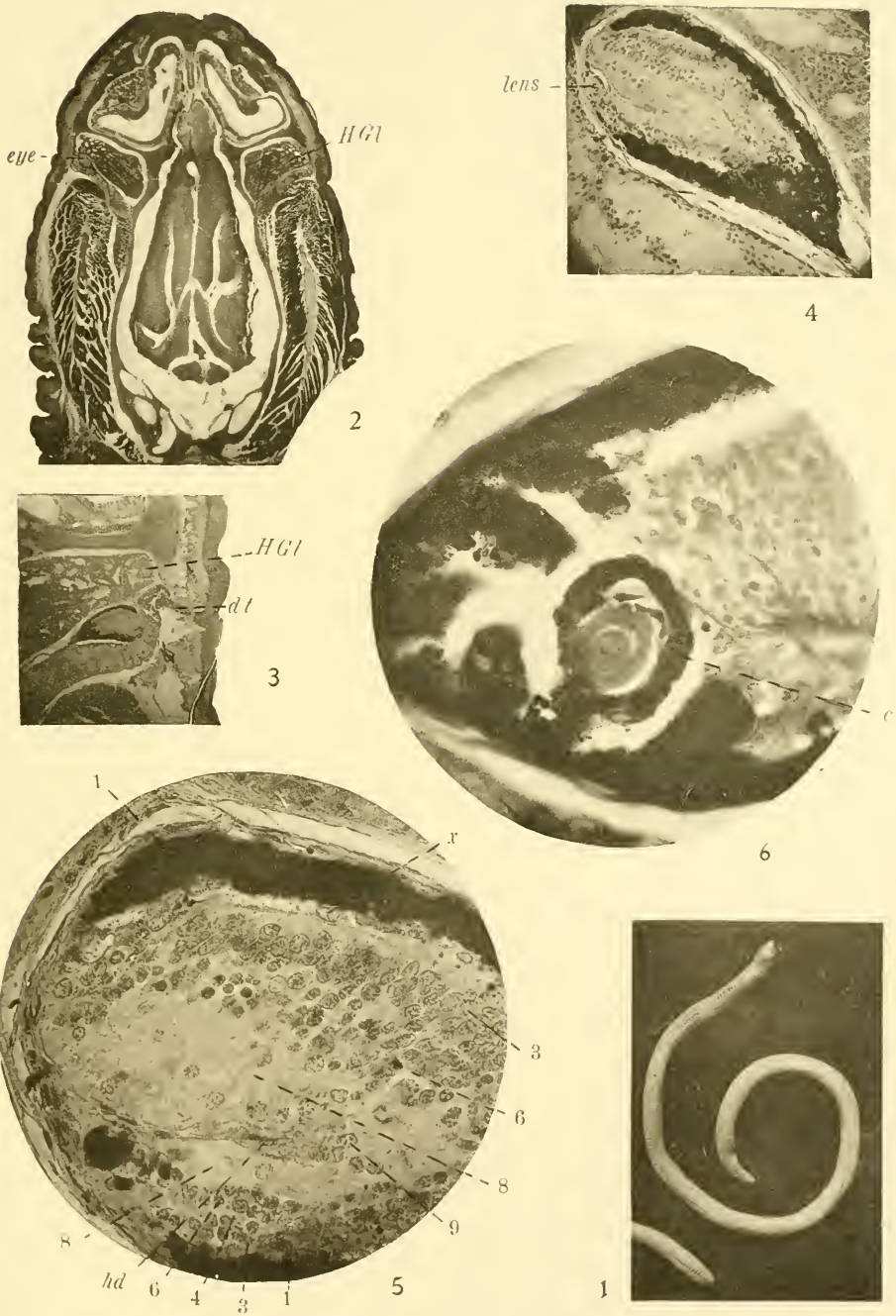
NOTE.—All figures are from photographs.

FIG. 1. Side view of *Rhineura floridana* and dorsal view of its tail.

2. Horizontal section of head showing Harder's gland and position of the eye.
3. Horizontal section through right eye showing the solid strand of cells extending from Harder's gland to near the epidermis.
4. Horizontal section of left eye of same individual showing extent of pigmentation and lens.
5. Distal part of another section of same eye showing the different layers of the retina at their highest development. 2 mm. objective.
6. Proximal part of another eye showing the cyst represented diagrammatically in Pl. XXXIII, fig. 3. 2 mm. objective.

EXPLANATION OF NOTATION USED.

| | |
|---|---|
| 1. Pigment epithelium. | <i>dt.</i> Solid duct of Harder's gland. |
| 3. Outer nuclear layer. | <i>H. Gl.</i> Harder's gland. |
| 4. Outer reticular layer. | <i>hd.</i> Hyaloid membrane. |
| 6. Inner nuclear layer. | <i>L.</i> Sinistrad. |
| 8. Inner reticular layer. | <i>lens.</i> Lens. |
| 9. Ganglionic layer. | <i>n.op.</i> Optic nerve. |
| c. Cyst of pigment cells containing pigmentless material. | <i>p.</i> Margin of pupil. |
| <i>chr.</i> Choroid. | <i>R.</i> Dextrad. |
| <i>chr.f.</i> Choroidal fissure. | <i>scl.</i> Sclera. |
| <i>cps.</i> Blood corpuscles. | <i>V.</i> Ventrad. |
| <i>D.</i> Dorsad. | <i>x.</i> Flattened cells beneath the pigment epithelium. |



From photographs.

EYES OF RHINEURA FLORIDANA.

PROCEEDINGS
OF THE
WASHINGTON ACADEMY OF SCIENCES
VOL. IV, PP. 549-560. [PLATE XXXV.] SEPTEMBER 30, 1902.

PAPERS FROM THE HOPKINS STANFORD GALA-
PAGOS EXPEDITION, 1898-1899.

XIII.

MARINE MOLLUSCA.

BY H. A. PILSBRY AND E. G. VANATTA.

CONTENTS.

| | |
|--|-----|
| Introduction | 549 |
| Catalogue of Species | 550 |
| Descriptions of New Species | 556 |
| Mollusks collected at Cocos Island | 559 |

INTRODUCTION.

THE collection here reported on was made by Robert E. Snodgrass and Edmund Heller, and forms a part of the zoölogical museum of Stanford University. A duplicate series, including most of the species, is in the collection of the Academy of Natural Sciences of Philadelphia.

The molluscan fauna of the Galapagos has recently been catalogued and some new species described by Dr. Robert E. C. Stearns, of Los Angeles, Cal., his results being published in the Proceedings of the U. S. National Museum, 1893, Volume XVI, pp. 353-450. References to the literature are set forth with such fullness in Dr. Stearns's paper that it is not deemed necessary to repeat them here. Stearns used chiefly the material collected by the U. S. Fish Commission steamer *Albatross*, at James, Indefatigable, Hood, Charles, Chatham and Duncan

Islands. The present collection was made mainly on the west side of Albemarle and the adjacent shore of Narboro, from which islands only three species have hitherto been recorded.

In the list compiled from all sources by Dr. Stearns the total of marine species is 267, 102 of which he identified from the *Albatross* and other collections in the U. S. National Museum. The present list enumerates 101 species, of which about 25 are not included in the several lists quoted by Stearns. It is likely that the number now known from the islands is much less than one half of the total number of littoral species, as very few small and minute forms have been recorded. Moreover, it is obvious that in the catalogue as it now stands, the identifications are of unequal value, and some clearly require revision; a work which cannot profitably be undertaken with the material now available in any one museum.

CATALOGUE OF SPECIES.

PELECYPODA.

Family Arcidæ.

Arca multcosta Sowb., Tagus Cove, Albemarle.

Arca solida B. and S., Tagus Cove, Iguana Cove and Point Christopher, Albemarle.

Arca velata Sowb., Tagus and Iguana Coves and Point Christopher, Albemarle.

Arca reticulata Gmel., Tagus Cove and Point Christopher, Albemarle; Narboro.

Family Pernidæ.

Perna chemnitziana Orb. (?), Tagus Cove, Albemarle.

Family Ostreidæ.

Ostrea mexicana Sowb., Narboro.

Ostrea rosacea Sowb., Tagus Cove, Albemarle.

Family Anomiidæ.

Placunanomia foliata Brod., Tagus Cove, Albemarle.

Family Pectenidæ.

Pecten magnificus Sowb., Tagus Cove and Narboro, opposite Tagus Cove.

Family **Limidæ**.

Lima angulata Sowb., Tagus Cove, Albemarle.

Lima galapagensis Pils. and Van., Tagus Cove, Albemarle.

Family **Mytilidæ**.

Mytilus multiformis Cpr. (?), Narboro.

Lithophagus aristatus Sol., Tagus Cove, Albemarle.

Family **Carditidæ**.

Venericardia flammea Mich., Bindloe.

Family **Lucinidæ**.

Codakia (Jagonia) galapagana Dall, Point Christopher and Tagus Cove, Albemarle; Narboro.

Family **Chamidæ**.

Chama frondosa purpurascens Conr., Tagus Cove, Albemarle.

Family **Cardiidæ**.

Cardium apicinum Cpr., Tagus Cove, Albemarle.

Family **Veneridæ**.

Venus multicostata Sowb., Tagus and Iguana Coves, Albemarle.

Venus succincta Val., Tagus Cove and Point Christopher, Albemarle; Narboro.

Venus tricolor Sowb., Tagus Cove, Albemarle; Narboro.

Callista affinis Gmel., Tagus Cove, Albemarle.

Dosinia dunkeri Phil., Tagus Cove, Albemarle.

Dosinia ponderosa Gray, Tagus Cove, Albemarle.

Family **Petricolidæ**.

Petricola amygdalina Sowb., Tagus Cove, Albemarle.

Family **Semelidæ**.

Semele punctata Sowb., Tagus Cove, Albemarle.

Semele solida Gray (proxima Ads.), Tagus Cove, Albemarle.

Family **Tellinidæ**.

Lutricola cognata Pils. and Van., Tagus Cove, Albemarle.

POLYPLACOPHORA.Family **Chitonidæ.**

Chiton goodalli Brod., Iguana Cove, Albemarle.

Chiton sulcatus Wood, Iguana and Tagus Coves, Albemarle; Narboro.

Family **Acanthochitidæ.**

Acanthochites hirudiniformis Sowb., Tagus Cove, Albemarle.

GASTROPODA.Family **Acmaeidæ.**

Acmaea mitella Mke., Iguana and Tagus Coves, Albemarle.

Family **Fissurellidæ.**

Fissurella obscura Sowb., Iguana and Tagus Coves, Albemarle; Culpepper.

The nominal species *F. macrotrema* Sowb. and *F. longifissa* Sowb. are unquestionably synonyms of *F. obscura*, though they have hitherto been given specific rank in the books. *F. asperella* Sowb. is closely allied, but may be distinct by its sculpture of raised dots.

The color-form *longifissa* was taken at Tagus Cove and Point Christopher.

Fissuridea inæqualis Sowb., Iguana and Tagus Coves and Point Christopher, Albemarle.

Family **Trochidæ.**

Chlorostoma cooksoni Smith, Iguana Cove, Albemarle.

Chlorostoma snodgrassi Pils. and Van., Iguana and Tagus Coves and Point Christopher, Albemarle; Narboro.

Calliostoma leanum C. B. Ad., Tagus Cove, Albemarle.

Family **Eulimidæ.**

Stylifer astericola Brod., var., Tagus Cove, Albemarle.

Family **Naticidæ.**

Polinices uber Val., Tagus Cove, Albemarle; Narboro.

Family **Calyptæidæ.**

Amalthea grayana Mke., Tagus Cove, Albemarle.

Crepidula aculeata Gmel., Tagus Cove, Albemarle.

Crepidula adunca Sowb., Wenman.

Crepidula onyx Sowb., Tagus Cove, Albemarle.

PLATE XXXV.

- FIG. 1. *Cerithidea muata* sp. nov.
2. *Drillia roseobasis* sp. nov.
3. *Drillia albemarlensis* sp. nov.
4. *Lima galapagensis* sp. nov.
5. *Lutricola cognata* sp. nov.
6. *Chlorostoma snodgrassi* sp. nov.
7. *Chlorostoma snodgrassi* sp. nov.

Crepidula unguiformis Lam, Tagus Cove and Point Christopher, Albemarle.

Calyptrea sordida Brod., Tagus Cove, Albemarle.

Crucibulum imbricatum Brod., Point Christopher, Albemarle.

Crucibulum imbricatum trigonale A. and R., Tagus Cove, Albemarle.

Mitralaria varia Brod., Iguana Cove and Point Christopher, Albemarle; Narboro.

Family **Rissoiidae**.

Rissoina fortis Ad., Tagus Cove, Albemarle.

Rissoina inca Orb., Iguana Cove, Albemarle.

Family **Littorinidae**.

Tectarius galapagensis Stearns, Iguana Cove, Albemarle; Culpepper.

Litorina (*Tectarius*) *galapagensis* Stearns, Nautilus, vi, p. 87, Dec., 1892; Proc. U. S. Nat. Mus., xvi, p. 396, pl. 51, f. 7, 1893.

Litorina (*Tectarius*) *atyphus* Stearns, Nautilus, vi, p. 88; Proc. U. S. Nat. Mus., xvi, p. 350, pl. 50, f. 5, 1893.

These two species were based upon specimens showing differences of sculpture, which are shown by the series from Albemarle to be completely connected by shells intermediate in sculpture. These are so numerous that *atyphus* cannot be retained in even a varietal sense.

Family **Planaxidae**.

Planaxis planicostatus Sowb., Culpepper.

Family **Modulidae**.

Modulus cerodes A. Ad., Tagus Cove, Albemarle.

Family **Cerithiidae**.

Cerithium maculosum Kien., Iguana and Tagus Coves, Albemarle; Narboro.

Cerithium uncinatum Gmel., Tagus Cove, Albemarle.

Cerithidea mutata Pils. and Van., Tagus Cove, Albemarle.

Family **Cypræidae**.

Cypræa exanthema cervinetta Kien., Tagus Cove, Albemarle; Narboro. The specimens measure 66 and 92 mm. long.

Cypræa nigropunctata Gray, Point Christopher, Albemarle; Narboro.

Trivia maugeriæ Gray, Tagus Cove, Albemarle.

Proc. Wash. Acad. Sci., Sept., 1902.

Trivia galapagensis Melv., Galapagos, locality unspecified.

Trivia pacifica Gray, Galapagos, locality unspecified.

Family **Cassididæ**.

Cassis tenuis Gray, Iguana Cove, Albemarle; Narboro.

Lambidium tuberculosum Sowb., between Tagus Cove and Narboro.

Family **Aquillidæ**.

Aquillus lineatus Brod., Tagus Cove, Albemarle.

Aquillus vestitus Hinds., Tagus Cove, Albemarle.

Family **Coralliophilidæ**.

Coralliophila californica A. Ad., Tagus Cove, Albemarle.

Coralliophila callaoensis Gray, Tagus and Iguana Coves, Albemarle.

Family **Muricidæ**.

Monoceros grande Gray, east side of Narboro; Tagus and Iguana Coves and Point Christopher, Albemarle.

Purpura columellaris Lam., Iguana Cove and Point Christopher, Albemarle; Culpepper.

Purpura melones Ducl., Iguana Cove, Albemarle; Wenman; Culpepper; Narboro.

Purpura patula L., Tagus and Iguana Coves and Point Christopher, Albemarle; Culpepper; Wenman.

Purpura planospira L., Iguana Cove, Albemarle; Culpepper; Wenman.

Murex dipsacus Brod., Tagus Cove, Albemarle.

Murex princeps Brod., Iguana Cove and Point Christopher, Albemarle; Narboro.

Family **Columbellidæ**.

Columbella atramentaria Sowb., Iguana Cove, Albemarle.

Columbella castanea Sowb., Iguana and Tagus Coves, Albemarle; Narboro.

Columbella cribraria Lam., Iguana Cove, Albemarle; Narboro.

Columbella fuscata Sowb., Iguana Cove, Albemarle; Narboro.

Columbella hæmastoma Sowb., Iguana Cove, Albemarle.

Columbella lanceolata Sowb., Tagus Cove, Albemarle.

Family **Nassidæ**.

Nassa angulifera A. Ad., Tagus Cove, Albemarle; Narboro.



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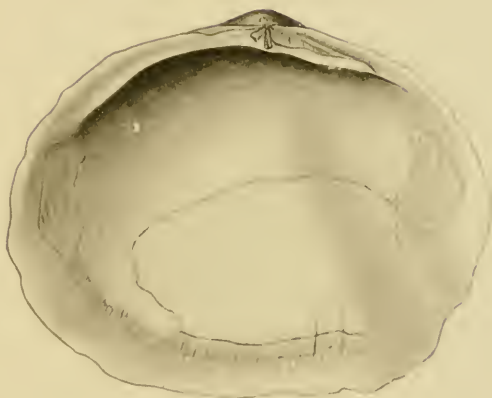
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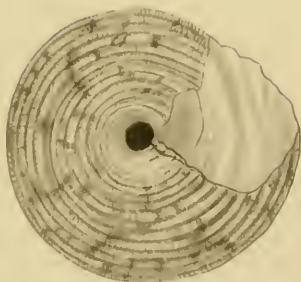
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MARINE MOLLUSCA OF THE GALAPAGOS ISLANDS.

Family **Buccinidæ**.

Cantharus janellii Kien., Iguana Cove, Albemarle.

Tritonidea sanguinolenta Ducl., Iguana Cove, Albemarle; Culpepper; Wenman.

Engina carbonaria Reeve, Iguana Cove, Albemarle.

Family **Fasciolariidæ**.

Fasciolaria princeps Sowb., Iguana Cove, Albemarle; Narboro.

Latirus ceratus Gray, Iguana Cove, Albemarle; Narboro; Culpepper; Wenman.

Latirus varicosus Reeve, Iguana Cove, Albemarle.

Family **Mitridæ**.

Mitra lens Wood, Iguana Cove, Albemarle.

Family **Olividæ**.

Olivella gracilis Brod., Tagus Cove, Albemarle.

Family **Marginellidæ**.

Marginella varia Sowb., Tagus Cove, Albemarle.

Family **Pleurotomidæ**.

Drillia albemarlensis Pils. and Van., Tagus Cove, Albemarle.

Drillia roseobasis Pils. and Van., Tagus Cove, Albemarle.

Family **Conidæ**.

Conus brunneus Gray, Point Christopher, Albemarle; Narboro.

Conus fergusonii Sowb., Tagus Cove, Albemarle.

Conus nanus Brod., Iguana Cove, Albemarle.

Conus commodus A. Ad. (?), Wenman. Much worn. Taken from a shark's stomach.

Conus purpurascens Brod., Tagus and Iguana Coves and Point Christopher, Albemarle; Narboro.

Family **Terebridæ**.

Terebra larvæformis Hinds, Tagus Cove, Albemarle.

OPISTHOBRANCHIATA.Family **Bullidæ**.

Bullus rufolabris A. Ad., Tagus Cove and Point Christopher, Albemarle; Narboro.

The generic name *Bulla* L. was preoccupied by Linnaeus himself, in Orthoptera, Syst. Nat., x, p. 427. We are, therefore, compelled to revive the term *Bullus* Montfort, which though clearly of the same etymology fundamentally as *Bulla*, yet so far as the record goes may be held to be a re-latinization of the French word *Bulle*.

Family **Dorididæ**.

Doris peruviana Orb., Tagus Cove, Albemarle.

Family **Cavoliniidæ**.

Cavolinia uncinata Rang., surface, near Wenman.

PULMONATA.

Family **Onchidiidæ**.

Onchidium lesliei Stearns, eastern shore of Narboro.

CEPHALOPODA.

Family **Onychoteuthidæ**.

Enoploteuthis lesueuri Fér. and Orb., Wenman. Taken from stomach of *Charcharinus*.

DESCRIPTIONS OF NEW SPECIES.

LUTRICOLA COGNATA sp. nov.

(Pl. xxxv, fig. 5.)

Shell rounded-quadrate, moderately compressed, bent to the right posteriorly, rather thin, gray-white. Sculptured with irregular growth wrinkles and low radial striæ, covered with an extremely minute secondary radial striation. Beaks median, worn at the tip. Anterior margin rounded; posterior margin subtruncate, the basal margin straightened, sinuous; pallial sinus ample. Length of right valve, 51.5 mm., alt. 41, diameter 11. Length of left valve, 41 mm., alt. 34, diameter 8. From Tagus Cove, Albemarle.

Closely related to *L. alta* Conr., but higher, shorter, of a more quadrate shape. The anterior end of the pallial sinus is more rounded, and its upper margin is not sinuous. *L. excavata* Sowb. is a more wedge-shaped shell.

LIMA GALAPAGENSIS sp. nov.

(Pl. xxxv, fig. 4.)

Shell oblique, compressed, dirty white, sculptured with numerous radial riblets, which are rounded, and as wide as their intervals, crossed by crowded and slightly lamellar growth-striæ; the auricles

having growth-striæ only. Both anterior and posterior ends gape widely, and while both are thickened within, neither has a marginal rib. Anterior margin vertical to the hinge-line, straight, curving below into the expanded and broadly, obliquely rounded basal margin; posterior margin oblique, a little concave above. Alt. 30 mm., greatest antero-posterior dimension (measured obliquely across the widest part of the valve), 20 mm.; length of hinge-line, 12 mm.; diameter of closed valves, 11.5 mm. From Tagus Cove, Albemarle.

Lima pacifica Orb. (*L. arcuata* Sowb., preoc.) is broader below, with shorter hinge-line, and the posterior gape is smaller than the anterior, while in *L. galapagensis* the gape at the two ends is subequal.

CHLOROSTOMA SNODGRASSI sp. nov.¹

(Pl. xxxv, figs. 6, 7.)

Shell umbilicate, conic with somewhat flattened base, very strong and solid, thick; of a pale brown or green tint variegated with large, irregular black stripes or flames above, interrupted beneath, the base being irregularly tessellated or speckled. Spire conically elevated. Whorls $6\frac{1}{2}$ or 7, quite convex, the last rounded at the periphery. Surface lusterless. Sculpture of somewhat unequal spiral cords of which there are 19 or 20 on the last whorl, most of them, especially several in the peripheral region, being weakly granose; closely crowded oblique lamellæ in the direction of growth-lines crossing them, subobsolete on the summits of the ribs, but conspicuous in the interstices. The aperture very oblique, rounded-trapezoidal, the nacre iridescent within, the lip having a dull white border within the dark edge. Columella short, vertical, thin, and excised, two small contiguous teeth at its junction with the basal lip, another near them upon the latter; the upper insertion of the columella is produced in a tongue-shaped, *intensely green callus* partially surrounding the umbilicus. Umbilicus narrow and deep, contracted at the opening. The dimensions of three specimens are: length, 15.5, 13, 17 mm.; diameter 16, 15, 15 mm. From western coast of Albemarle at Iguana Cove, Point Christopher and Tagus Cove.

This species is more conic than *Chlorostoma reticulatum*, *C. ligulatum*, or *C. turbinatum*. The columellar callus is green, like that of *C. turbinatum*.

It is, we think, the *Trochus impressus* of Fischer, *Chlorostoma impressum* of Pilsbry's monograph; but it is not *Trochus impressus* "Jonas" Philippi, which is a synonym of *T. corvus* "Jonas" Phil., 1849. This latter species has radially waved whorls above and otherwise differs from *C. snodgrassi*.

CERITHIDEA MUTATA^{em} sp. nov.

(Pl. xxxv, fig. 1.)

Shell turreted, *thin*, black with a subperipheral reddish girdle; weathering to pale pinkish brown, variously clouded with dirty white. Whorls 8 in the largest specimens, which have apparently lost two or three; very convex; impressed, flattened, or a little concave below the suture; more or less carinate below the flattened subsutural band. The last whorl is produced very little below. Sculpture of narrow, close, curved ribs, a little more prominent below the subsutural impression, absent on the base, often strengthened into a series of beads or small knobs, strung along below the suture; everywhere decussated by low spiral cords separated by narrow grooves, and more or less strongly developed on various individuals. Aperture irregularly oval, the outer margin much more arcuate than the inner; outer lip thin; base excised in a shallow, wide notch. Columella short, obliquely truncate below. Length 14 mm., diameter 5.6 mm. From Tagus Cove, Albemarle, in a salt tide-pool in a mangrove swamp.

This species reminds one of *C. tenuis* Pfr. of the lagoons of the Bahamas, having the same thin texture. It is probably related to *C. sacrata* Gld., having fundamentally similar sculpture. It is evidently a brackish water species.

DRILLIA ROSEOBASIS sp. nov.

(Pl. xxxv, fig. 2.)

Shell fusiform, turreted, rather solid, coarsely ribbed, the ribs white, interstices pinkish-brown, the base pink or rose colored. Surface glossy. Sculpture of strong, rounded, longitudinal ribs, separated by narrower intervals, ten ribs on the last whorl; the narrow anterior portion spirally striate, the ribs obsolete there; three apical whorls smooth and polished, convex. Subsequent whorls 7, convex, separated by an undulating suture, the last tapering below. Aperture white with a pink stripe or two within; outer lip thin, arcuate, retracted in a shallow sinus above. Columella convex, pink. Length 13.5 mm., diameter 5.2 mm., length of aperture 5.5 mm. From Tagus Cove, Albemarle. A heavily ribbed, bright colored species, with shallow sinus.

DRILLIA ALBEMARLENSIS sp. nov.

(Pl. xxxv, fig. 3.)

Shell slender, turreted, brown, glossy. Sculpture of obliquely longitudinal ribs curved backward along the anal fasciole. On the last whorl these are rather small and irregularly developed, disappear just

below the periphery, and are more prominent below the anal fasciole. The preceding whorls³ are concave above, convex below, the ribs strong and prominent on the convex portion, low and irregular on the concave. Ascending the spire the concave portion widens at the expense of the convex, so that several earlier post-nepionic whorls are concave and ribbed, with a rather acute and nodulose keel near the lower suture. Below the anal fasciole the surface is strongly lyrate spirally, the cords wider than the grooves and about 15 in number on the last whorl. Similar spirals are faintly indicated on the anal fasciole. Whorls 10, the earlier two rounded, smooth, forming a slightly bulbous nucleus. Aperture small; outer lip thin, retracted in a narrow sinus above. Inner lip heavily calloused at its posterior termination. Length 11.2 mm., diameter 3.9 mm. (Cotype in the collection of the Academy of Natural Sciences, Philadelphia.) Length 12.8 mm. (cotype in the collection of Stanford University, Cal.). From Tagus Cove, Albemarle.

Related to *D. pallida* Sowb. (Proc. Zool. Soc., 1833, p. 137), but much smaller, the base less contracted, darker colored and differing in various details of sculpture. Three specimens were taken, of which two are in the Stanford University collection and one in the collection of the Academy of Natural Sciences, Philadelphia, No. 81947.

MOLLUSKS COLLECTED AT COCOS ISLAND.

The following is a list of the marine shells collected at Cocos Island. In the main these are Galapagos species. There are, however, a few endemic and Panama forms. The occurrence in some numbers of *Chlorostoma maculostriatum*, an Antillean species, is noteworthy.

| FAMILY. | SPECIES. |
|----------------|--|
| Pernidæ : | <i>Perna chemnitziana</i> Orb. (?) |
| Chitonidæ : | <i>Chiton stokesi</i> Brod. |
| Acmæidæ : | <i>Acmæa strigatella</i> Cpr. <i>Scarria mesoleuca</i> Mke. |
| Fissurellidæ : | <i>Fissurella virescens</i> Sowb. |
| Neritidæ : | <i>Nerita fulgurans bernhardi</i> Recl. |
| Trochidæ : | <i>Chlorostoma gallinum multifilosum</i> Stearns. <i>Chlorostoma maculostriatum</i> C. B. Ad. |
| Amaltheidæ : | <i>Amalthea grayana</i> Mke. |
| Planaxidæ : | <i>Planaxis planicostatus</i> Sowb. |
| Cerithiidæ : | <i>Cerithium maculosum</i> Kien. |
| Muricidæ : | <i>Purpura columellaris</i> Lam. <i>Purpura patula</i> L. <i>Purpura melones</i> Ducl. |
| Columbellidæ : | <i>Columbella labrosa</i> Sowb. <i>Columbella cribraria</i> Lam. |
| Buccinidæ : | <i>Tritonidea cinis</i> Reeve. <i>Tritonidea sanguinolenta</i> Ducl. |
| Siphonariidæ : | <i>Siphonaria gigas</i> Sowb. |

PLATE XXXV.

- FIG. 1. *Cerithidea muiata* sp. nov.
2. *Drillia roseobasis* sp. nov.
3. *Drillia albemarlensis* sp. nov.
4. *Lima galapagensis* sp. nov.
5. *Lutricola cognata* sp. nov.
6. *Chlorostoma snodgrassi* sp. nov.
7. *Chlorostoma snodgrassi* sp. nov.

Trivia galapagensis Melv., Galapagos, locality unspecified.

Trivia pacifica Gray, Galapagos, locality unspecified.

Family **Cassididæ.**

Cassis tenuis Gray, Iguana Cove, Albemarle; Narboro.

Lambidium tuberculosum Sowb., between Tagus Cove and Narboro.

Family **Aquillidæ.**

Aquillus lineatus Brod., Tagus Cove, Albemarle.

Aquillus vestitus Hinds., Tagus Cove, Albemarle.

Family **Coralliophilidæ.**

Coralliophila californica A. Ad., Tagus Cove, Albemarle.

Coralliophila callaoensis Gray, Tagus and Iguana Coves, Albemarle.

Family **Muricidæ.**

Monoceros grande Gray, east side of Narboro; Tagus and Iguana Coves and Point Christopher, Albemarle.

Purpura columellaris Lam., Iguana Cove and Point Christopher, Albemarle; Culpepper.

Purpura melones Ducl., Iguana Cove, Albemarle; Wenman; Culpepper; Narboro.

Purpura patula L., Tagus and Iguana Coves and Point Christopher, Albemarle; Culpepper; Wenman.

Purpura planospira L., Iguana Cove, Albemarle; Culpepper; Wenman.

Murex dipsacus Brod., Tagus Cove, Albemarle.

Murex princeps Brod., Iguana Cove and Point Christopher, Albemarle; Narboro.

Family **Columbellidæ.**

Columbella atramentaria Sowb., Iguana Cove, Albemarle.

Columbella castanea Sowb., Iguana and Tagus Coves, Albemarle; Narboro.

Columbella cribraria Lam., Iguana Cove, Albemarle; Narboro.

Columbella fuscata Sowb., Iguana Cove, Albemarle; Narboro.

Columbella hæmastoma Sowb., Iguana Cove, Albemarle.

Columbella lanceolata Sowb., Tagus Cove, Albemarle.

Family **Nassidæ.**

Nassa angulifera A. Ad., Tagus Cove, Albemarle; Narboro.



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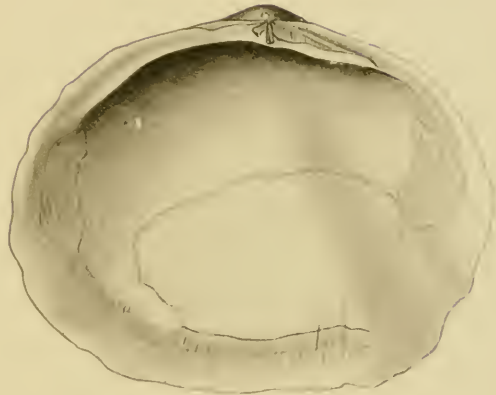
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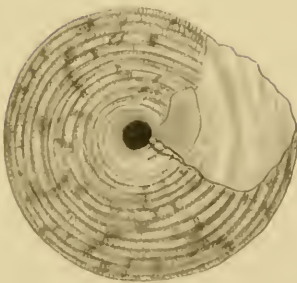
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5



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7

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INDEX

NOTE.—New species and varieties in **blackface type**, synonyms in *italics*.

- Acanthochites hirudiniformis 552
 Acanthochitidæ 552
 Acarina 70
 Aclastus 187
 rufipes 187
 Aclista 139
 californica 139
 Acmaea mitella 552
 Acmaeidæ 552
Acridium literosum 425
 melanocerum 419
 Acrolyta 186
 aciculata 186
 karlukensis 186
 Actæa dovii 281
 Actinia 391
 sipunculoides 378
 Actiniaria 375
 Actiniidæ 387
 Actiniinæ 383
 Admestina insularis 66
 Ænoplex 188
 rufipes 188
 Affiliated societies 8
 Agalenidæ 58
 Alaska, Harriman Expedition —
 Anemones 373
 Apterygota 87
 Hymenoptera 117
 Mosses 293
 Algina 188
 alaskensis 188
 Allantus 263
 flavomarginis 262
 heraclei 263
 Allœini 242
 Allotriinæ 142
 Alloxysta 142
 alaskensis 142
 Alpheidæ 288
 Alpheus malleator 288
 neptunus 289
 pugilator 288
 Alsia abietina 331
 Alysia 241
 fossulata 241
 manducator 241
 stercoraria 241
 Alysiidæ 244
 Alysiinæ 241
 Alysiini 241
 Amalthea grayana 552
 Amauronematus 259
 isolatus 259
 Amblyomma pilosum 70, 80
Amblypneustes formosus 527
 Amblystegium serpens 337, 346
 serpens beringianum 338
 varium alaskanum 338, 346
 Ameloctonus 237
 popofensis 237
 Ammotrecha solitaria 69, 80
 Amphiuira verticillata 525
 Amphoridium lapponicum 309
 mougeotii 309, 346
 Anarcha 241
 coxalis 241
 Ancistronea gigas 483
 Andraea papillosa 294
 parvifolia 294
 petrophila 294
 petrophila sylvicola 294
 Andraeaceæ 294
 Andraeales 294
 Andrena 131
 frigida 131
 Andrenidæ, 131
 Anemones, by H. B. Torrey 373
 bibliography 406
 distribution 374
 Anæctangium compactum 294
 compactum alaskanum 294
 Anomalini 233
Anomalon mellipes 202
 Anomiidæ 550
 Anous stolidus ridgwayi 507
 stolidus rousseaui 507
 Antitrichia californica 331
 curtipendula 331
 curtipendula gigantea 331
 Anura gigantea 88
 Anurida amorita 90
 Aongstroemia longipes 297, 346
 Apautes 249
 yakutatensis 249
 Apathus insularis 130
 Aphidiinæ 243
 Aphidius 244
 frigidus 244, 245, 246
 glacialis 245
 paulensis 244, 245, 246
 propinquus 245
 Aphorura dentata 91
 octopunctata 90
 Apoidea 123
 Apterygota by J. W. Folsom 87
 bibliography 104
 Aquillidæ 554
 Aquillus lineatus 554
 vestitus 554
 Arachnida by Banks and Snodgrass 49
 geographic distribution 51
 Arachnophila 134
 septentrionalis 134
 Arachnospila septentrionalis 134
 Aranea argentata 60
 regia 63

- Araneida 55
 Arbacia stellata 527
 Arca multica 550
 reticulata 550
 solida 550
 velata 550
 Arcidae 550
 Argas transversa 70, 80
 Argiope argentata 60, 74
Argiopes argentata 60
 Argyrodes jucundus 59, 73
Argyropeira fragilis 61
 nigri ventris 61, 77
 volupis 61
 Ariadne tarsalis 57
 Arthrogastra 67
 Ashmead, W. H., Hymenoptera 117
 Asteroidea 522
 Asynocrita 163
 species 163
 Atemnus insularis 68, 80
 Atmetus 231
 insularis 231
 Atractodes 169
 yakutatensis 169
Atrichum leiophyllum 326
 lescurii 325
 parallelum 326
 Atrometus 233
 alaskensis 233
 Attidae 66
Attus ligo 66
 Auditing Com. report 17
 Aulacomnium androgynum 325, 346
 palustre 325
 turgidum 325
 Automalus 148
 nigropilosus 148
 Aysha pacifica 58, 71

 Bachia 185
 nigra 185
 Bactrocera 254
 palachei 254
 sitkensis 254
 Banks, Nathan, Arachnida 49
 Barbula aciphylla 306, 346
 brachypoda 303
 cylindrica 305
 fragilis 305
 rigens 305
 ruralis 306
 saundersii 304
 subcuneifolia 306
 treleasei 305
 Bartramia breviseta 314
 circinnulata 314
 ithyphylla 313
 ithyphylla rigidula 313
 ithyphylla strigosa 313
 menziesii 314
 cederi 314
 pomiformis 313
 subulata 314
 Bartramiaceae 313
 Bartramiopsis lescurii 325
 silkana 325
 Bassini 224
 Bassus 224
 manducator 241
 pulchripes 224
 tibialis 226

 Bathymetis 173
 bicolor 182
 confusa 180
 imitator 177
 nigricornis 177
 quadriceps 181
 rubrocincta 178
 simillima 179
 simulans 178
 simulator 181
 ungæ 180
 Belytidæ, 137
 Bioblapsis 224
 tricincta 224
 Birds of Clipperton and Cocos islands by
 Snodgrass and Heller 505
 Blennocampinae 255
 Blepharipus 132
 ater 132
 Blephoctonus flavosus 232
 Blindia acuta 300
 acuta flexipes 300
 Bombidæ 123
 Bombus 123
 alaskensis 128
 californicus 124
 carriei 126
 columbicus 124
 couperi 126
 dimidiatus 129
 flavifrons 124, 127
 frigidus 126
 gelidus 127
 howardii proximus 124
 interruptus 130
 juxta 127
 kincaidii 127
 lacustris 128
 mckayi 125
 melanopyge 128
 melanopygus 127, 128
 menestriesii 128
 mixtuosus 128
 moderatus 123
 modestus 123
 nearticus 127
 neglectulus 124
 nevadensis 124
 oregonensis 126
 parvulus 127
 pennsylvanicus 124
 pleuralis 127
 polaris 127
 proximus 124
 prunellæ 126
 sitkensis 126
 suckleyi 130
 sylvicola 127
 ternarius lacustris 128
 terricola modestus 123
 terricola proximus 124
 vosnesenski 124
 Brachythecium albicans 334
 asperrimum 335, 346
 beringianum 333
 lamprochryseum giganteum 335
 novæ-angliæ 334, 346
 plumosum 335, 346
 reflexum 333
 reflexum pacificum 335
 rivulare 334
 salebrosum 334

Brachyura and Macrura by M. J. Rathbun 275

Bracon manducator 241

Braconidae 243

Braconinae 252

Braconini 252

Bryaceae 315

Bryales 294

Bryum 317

acutiusculum 321

agattuense 318

alaskanum 323

argenteum 319

ateleostomum 317

bimum 319, 346

brachyneuron 323

bullatum 323

cæspitium 321

capillare 323

cylindrico-arcuatum 319

drepanocarpum 322

duvalii 322

duvalii obtusatum 322

erythrophyllum 323

fallax 323

froudei 323

harrimani 322

heterogynum 320

inclinatum 318

lacustre 323

laurentianum 320

leptodictyon 320

meeseoides 323

microstegoides 323

mucronigerum 318

obtusifolium 323

pallens 321, 346

pallescens 319

pendulum 323

pseudostirtoni 321

pseudotriquetrum 322

stenotrichum 318

submuticum 323

suborbiculare 323

treleasei 318

wrightii 323

Buccinidae 555

Bullidae 555

Bullus rufolabris 555

Bunodactidæ 390

Bunodidæ 390

By-laws 5

Cænonydus nigropectus 254

Calliergidum 343

Calliergon 343

Callimome cecidomyiæ 143

Calliostoma leanum 552

Calliphirus 218

affinis 221

alaskensis 220

clypeatus 220

confusus 223

frigidus 222

glacialis 222

kukakensis 222

minor 221

perplexus 222

popofensis 221

Callista affinis 551

Calyptræa sordida 553

Calyptræidæ 552

Camaratops 232

kodiakensis 232

Campoplex 234

laticinctus 234

nigripes 234

Campopligini 234

Camptothecium lutescens 333

nitens 333

Campylopus schimperii 300

Cantharus janellii 555

Cardiidæ 551

Carditidæ 551

Cardium apicinum 551

Cardot, J., Mosses of Alaska 293

Cassididæ 554

Cassis tenuis 554

Catastenus 240

alaskensis 240

trifasciatus 240

Cavolinia uncinata 556

Cavoliniidæ 556

Cechenus manducator 241

Centeterus 161

dorsator 161

Centrurus princeps 68, 80

Cephaleia 254

nigropecta 254

nigropectus 254

Cephalopoda 556

Ceraphronidæ 140

Ceratodon heterophyllus 301

purpureus 301

Cerithidea mutata 553, 558

Cerithiidæ 553

Cerithium maculosum 553

uncinatum 553

Chalcidoidea 143

Chama frondosa purpurascens 551

Chamidæ 551

Charinus insularis 67, 79

Charisea 388

saxicola 388

Chelanops nigrimanus 69, 80

Chelidon erythrogaster 518

Cheloninae 247

Chelonus 247

iridescens 247

Chiton goodalli 552

sulcatus 552

Chitonidæ 542

Chlorostoma cooksoni 552

snodgrassi 552, 557

Chrysididæ 135

Chrysophyllum 338

Cidaridæ 526

Cimbex 263

americana 263

Cimbicidæ 263

Cimbicinae 263

Cladodium 317

Cladopodium bolanderi 333

crispifolium 333

laxifolium 333

Clark, H. L., Echinodermata 521

Climacium dendroides 331

ruthenicum 332

Clipperton island, Birds of, by Snodgrass

and Heller 501

Holothurians of, by H. L. Clark 530

Clubionidæ 58

- Clypeaster rotundus* 526
Clytochrysis 132
 gracilissimus 132
Coccyzus ferrugineus 517
Cocornis agassizi 518
 Cocos Island, Birds of, by Snodgrass and Heller 501
Codakia (Jagonia) galapagana 551
Columbella atramentaria 554
 castanea 554
 cribraria 554
 fuscata 554
 hæmastoma 554
 lanceolata 554
Columbellidæ 554
Colpocephalum 483
 milleri 483
 spineum 484
 unciferum 459, 484
Conidæ 555
Conostomum boreale 314
Conus brunneus 555
 commodus 555
 fergusoni 555
 nanus 555
 purpurascens 555
Coralliophila californica 554
 callaensis 554
Coralliophilidæ 554
Coryssocnemis conica 56, 71
 insularis 56
Coccinodon pulvinatus 309
Cosmoconus 215
 canadensis 215
Crabro ater 132
 contiguus 132
 gracilissimus 132
 parvulus 131
 succinctus 132
 vicinus 132
Crabronidæ 131
Crabroninæ 131
Craticheumon 156
 alaskensis 157
 confusus 158
 kodiakensis 157
 popofensis 159
 yakutatensis 157
Cratoneuron 340
Cremnodes alaskensis 190
Crepidula aculeata 552
 adunca 552
 onyx 552
 unguiformis 553
Cribrina 390
 artemisias 390
Cribrinidæ 390
Crucibulum imbricatum 553
 imbricatum trigonale 553
Cryptinæ 162
Cryptini 193
Cryptoideus 193
 sitkensis 193
Cryptus 203
Ctenidæ 64
Cteniscini 210
Cteniscus 210
 clypeatus 211
 nigrofemorialis 211
Ctenopelmini 212
Cubocephalus 202
 alaskensis 203
 atrocoxalis 203
 nigricomis 203
Cyclosa caudata 61, 77
Cylloceria fuscolina 195
Cynipoidea 141
Cynodontium polycarpum alaskanum 296
 torquescens 295
 treleasei 295
 virens 296
 virens serratum 296
 wahlenbergii 296
Cypræa exanthema cervinetta 553
 nigropunctata 553
Cypræidæ 553
Cyrba insularis 66

Dacnusinæ 242
Dallatorrea 205
 armata 205
Deleter 229
 flavifrons 229
 kincaidi 229
Delocarpa 242
 sitkensis 242
Dendroica aureola 520
Desmatodon latifolius 303
Desmlostoma 251
 kukakense 251
Desoria annulata 94
 cylindrica 94
 ebriosa 94
 fusca 94
 pallida 94
 vialica 94
 virescens 94
Diaborus 212
 citrifrons 212
 sexmaculatus 212
Diadema mexicanum 526
Diapriidæ 140
Dichodontium pellucidum 296
 pellucidum fagimontanum 296
 pellucidum kodiakanum 297
 pellucidum serratum 297
Dicranacæ 395
Dicranodontium aristatum 300, 346
 longirostre 300, 346
Dicranum albicans 298, 346
 anderssonii 297, 346
 bergeri 300
 bonjeani 300
 dipteroneuron 299
 elongatum 298
 fuscescens 299
 grœnlandicum 298, 346
 howellii 300, 346
 hyperboreum 298
 majus 300
 molle 300
 neglectum 299, 346
 scoparium 299
 spadiceum 299
 starkei 298, 346
 strictum 298
 subflagellare 298
Dictyna parietalis 59, 72
Dictynidæ 59

- Dicranella crispa* 297
 grevilleana 297, 346
 heteromalla 297
 heteromalla latinervis 297
 heteromalla orthophylla 297
 polaris 297
 rufescens 297
 squarrosa 297
 subulata 297
Dicranoweisia crispula 294
Didymodon baden-powellii 302
 rubellus 302
Diospilini 247
Discias 290
 serriifer 290
Dissodon splachnoides 312
Distichium capillaceum 301
Ditrichaceæ 301
Ditrichum flexicaule densum 301
 glaucescens 301
 homallum 301, 346
Docophorus 460
 albemarlenis 465
 breviformis 463
 communis 464
 galapagensis 464
 icterodes 462
 insulicola 466
 lari 463
 melanocephalus 462
 peristictus 462
 platycephalus 461
 validus minor 460
Dolerina 259
Dolerus 259
 aprilis 259
 elderi 260
 sericeus 260
 similis 260
Dolichoerabro 133
 wickhami 133
Dorididæ 556
Doris peruviana 556
Dosinia dunkeri 551
 ponderosa 551
Dosytheus aprilis 259
 similis 260
Drasidæ 57
Drepanocladus 339
Drillia albemarlenis 555, 558
 roseobasis 555, 558
Duck 517
Dyscoletes 247
 alaskensis 247
Dysderidæ 57
Dysporus cyanops 512

Echinodermata by H. L. Clark 521
Echinoidea 526
Eclytus 204
 yakutatensis 204
Ectemnius 131
 parvulus 131
Echthrodoca 199
 clypearia 199
 gelida 199
Echthrus nigricornis 203
Edwardsia 376
 sipunculoides 378
Edwardsiæ 375
Edwardsiella sipunculoides 378

Edwardsiidae 376
Eigenmann, C. H., Eyes of Rhineura
 floridana 533
Elachistinae 147
Elachistus 147
 glacialis 147
Elampus purpurascens 135
 sinuosum 135
 sinuosus 135
Emphytus 260
 angustus 260
 maculatus 256
 nigrofasciatus 260
Encalypta alaskana 311
 commutata 311
 macounii 311
 rhabdocarpa 311
 vulgaris 311
Encalyptaceæ 311
Encope micropora 527
Engina carbonaria 575
Enicospilus 233
 purgatus 233
Enizemum 226
 tibiale 226
Enoploteuthis lesneuri 556
Entomobrya kincaidii 96
Entomological results of Hopkins Stan-
 ford Expedition
 Arachnida 49
 Schistocerca, etc., 411
Entosthodon spathulifolius 312
Epiactis 391
 prolifera 392
 ritteri 393
Epeira cooksonii 60
 gregalis 61, 76
 labyrinthica 60, 75
 oaxensis 60, 74
 parvula 61
 prompta 61, 76
 vertebrata 60
Epeiridae 60
Epiurus 200
 atrocoxalis 201
 bicoloripes 201
Eriphia granulosa 282
Eriphides hispida 282
Eriplatys 162
 sitkensis 162
Erromenus 212
 annulipes 212
Erythraspides 255
 ashmeadii 255
Eucæla 142
 alaskensis 142
Eucælinae 141
Eulimidae 552
Eulophidæ 146
Eulophinae 147
Eulophus 147
 kukakensis 147
Eumenidæ 134
Eurhynchium cirrosum 336
 myosuroides 335
 myosuroides humile 336
 myosuroides spiculiferum 336
 myosuroides stoloniferum 336
 oregantum 336, 346
 pacificum 335
 stokesii 336, 346

- Eurhynchium (Continued).
 stokesii pseudo-speciosum 336
 strigosum fallax 336
 strigosum typicum 336
 vaucheri 336
 Eurymetopus brevis 482
 Eutelus 145
 confusus 145
 Euura 258
 insularis 258
 Exochini 232
Exochus curvator 232
 fulvipes 232
 lævis 233
 Exolytus 163
 alaskensis 167
 clypeatus 168
 insularis 168
 kincaidi 167
 niger 166
 perplexus 165
 popofensis 166
 rubrocinctus 169
 sanctipauli 166
 seldoviae 168
 ungæ 167
 ungensis 169
 Exotheus 252
 alaskensis 252
 Expedition, Harriman, see Alaska
 Hopkins Stanford, see Galapagos
 Eyes of Rhineura floridana, by C. H.
 Eigenmann, 533
 bibliography, 541
 Fasciolaria princeps 555
 Fascioliariidæ 555
 Fenusa 255
 alaskana 255
 Figitidæ 141
 Filistata fasciata 55
 Filistatidæ 55
 Fissurella asperella 552
 longifissa 552
 macrotrema 552
 obscura 552
 Fissurellidæ 552
 Fissuridea inæqualis 552
 Folsom, J. W. Apterygota 87
 Fontinalaceæ 330
 Fontinalis patula 330, 346
 Formica 136
 neorufibarbis 136
 Formicidæ 136
 Formicoidea 135
 Fregata aquila 516
 aquila minor 516
 Funaria hygrometrica 313
 hygrometrica calvescens 313
 Funariaceæ 312
 Galapagos, Hopkins Stanford Expedition
 Arachnida 49
 Birds of Clipperton and Cocos 501
 Brachyura and Macrura 275
 Echinodermata 521
 Entomological results 411, 457
 Mallophaga from birds 457
 Marine mollusca 549
 Schistocerca, Sphingonotus and Hal-
 menus 411
 Gasteracantha insulana 60, 73
 Gastropoda 552
 Gausocentrus 206
 Gemophaga 223
 rufa 223
 Geograpsus lividus 278
 Giebelia mirabilis 482
 Glypta 201
 kukakensis 201
 popofensis 201
 Gonicotes 481
 galapagensis 481
 Grapsidæ 278
 Grapsus grapsus 278
 Grimmia apocarpa 306
 apocarpa alpicola 306
 apocarpa gracilis 306
 apocarpa rivularis 306
 conferta 306
 elator 307, 346
 maritima 306, 346
 torquata 307
 Grimmiaceæ 306
 Gygis candida 511
 Gymnostomum curvirostre scabrum 294
 Gyrocampa 242
 alaskensis 242
 Habromma 188
 nigrum 188
Hadruroides charasus 68
 lunatus 68, 80
 maculatus 68
 Halcampidæ 384
 Halmenus 447, 451
 choristopterus 450
 cuspidatus 450
 robustus 412, 447, 448
 Harenactis 384
 attenuata 384
Harpiphorus maculatus 256
 Harriman Expedition, see Alaska
 Harrimaniella 198
 kukakensis 198
Hedychrum janus 135
 sinuosum 135
 Hedylus 185
 crassicornis 185
 species 185
 Helconinæ 247
 Heliaster cumingi 523
 multiradiata 524
 Heller E., Birds of Clipperton and Cocos
 Islands 501
 Hemitelini 186
 Heteractitis incanus 511
 Heteropoda venatoria 63, 78
Heteroloma chlorata 94
 Hexactiniæ 375
 Himertosoma 194
 schmiedeknechti 194
 Hippocæ depressa 526
 Holcostizus 202
 yukonensis 202
 Holothuria arenicola 528
 frequentiamensis 530
 fusco-rubra 527
 impatiens 528
 marenzelleri 528
 Holothurians of Clipperton Island 530
 Holothurioidea 527

- Homotropus 226
 alaskensis 226
 Hookeriaceæ 331
 Hopkins Stanford Expedition, see Galapagos
 Hygrohypnum 342
 Hylacomium alaskanum 344
 loreum 345
 rugosum 346
 splendens 344
 splendens gracilius 344
 squarrosus 345
 triquetrum 345
 triquetrum beringianum 346
 umbratum 345, 346
 Hymenoptera by W. H. Ashmead 117
 tabular exhibit 120
 Hypnaceæ 333
 Hypnum 338
 aduncum kneiffii 339
 alaskæ 341
 alaskanum 344
 callichroum 341, 346
 canadense 342
 circinale 341
 cordifolium 343
 crista-castrensis 341
 dieckii 342, 346
 filicinum 340
 fluitans 339
 fluitans alpinum 339
 fluitans exannulatum 339
 hamulosum 342
 krausei 343
 ochraceum 342
 ochraceum flaccidum 342
 plesiostramineum 343
 polygamum minus 339
 pseudo-complexum 344
 revolvens 339
 sarmentosum beringianum 343
 schreberi 343
 stellatum 339
 stramineum 343
 subeugyrium 342
 subeugyrium occidentale 342, 346
 sulcatum 341
 sulcatum stenodictyon 341
 treleasei 338
 uncinatum 339
 uncinatum breviseta 340
 uncinatum plumosa 340
 uncinatum plumosum 340
 uncinatum plumulosum 340
 uncinatum polare 340
 uncinatum subjulaceum 340
 vaucheri 342
 Hypocryptus 206
 kodiakensis 207, 208
 popofensis 207, 208
 seldoviae 207, 209
 tibialis 207, 209
 variegatipes 207, 208
 Hypoleptus 227
 alaskensis 227
 glacialis 228
 Hyposyntactus 217
 flavifrons 217
 Hypotherutes 236
 annulipes 236
 Ichneumon 149
 brevipennis 155
 cervulus 153
 curvator 232
 glacialis 154
 imitator 151
 kincaidl 152
 kodiakensis 153
 manducator 241
 popofensis 154
 simulator 153
 sitkensis 152
 wilsoni 155
 Ichneumonidae 148
 Ichneumonini 148
 Ichneumonoidea 148
 Ichneutes 250
 alaskensis 251
 popofensis 250
 reunitor 250
 Ichneutinae 250
 Ilapinastes 190
 incertus 190
 Incorporation, act of, 3
 Ischnoscopus 236
 yakutatensis 236
 Ischnus *wilsoni* 155
 Isochresta 190
 unicincta 190
 Isotheciaceæ 331
 Isotoma *alba* 92
 anglicana 94
 annulata 94
 arborea 94
 belfragei 95
 cærulea 94
 desmarestii 94
 finetaria 92
 fusca 94
 lineata 94
 pallida 94
 palustris 95
 palustris annulata 95
 palustris fusca 95
 palustris unicolor 95
 palustris viridis 95
 plumbea 95
 purpurascens 95
 tricolor 95
 virescens 94
 viridis 93
 viridis arctica 96
 Isurgus 239
 alaskensis 239
 Itycorsia 254
 marginiventris 254
 Ixodidae 70
 Joppini 148
 Kellogg, V. L., Mallophaga from birds 457
 Kuwana, S. I., Mallophaga from birds 457
 Lambidium *tuberculosum* 554
 Lampronota 195
 gelida 199
 lugubris 195
 Lasius 136
 niger sitkensis 136
 Lathrodectes *apicalis* 59, 73

- Latirus ceratus* 555
 varicosus 555
Leiotealia 391
Leptobryum pyriforme 315
Leptodius snodgrassi 279
Leptothorax 135
 yankee kincaidi 135
Leptotrichum tomentosum 301
Lescuræ imperfecta 332
Leskea laxifolia 333
Leskeaceæ 331
Leucodontaceæ 331
Leucolepis acanthoneura 325
Lima angulata 551
 galapagensis 551, 556
Limidæ 551
Limnerium 237
 yakutatense 237
Lipeurus 475
 baculus 478
 diversus 476
 diversus major 477
 exiguus 479
 gracilicornis major 477
 helleri 479
 languidus 475
 limitatus 476
 miriceps 480
 potens 477
Liposcia 243
 dubiosa 243
Lipura octopunctata 90
Lissa aurivilliusi 284
Lissonota 197
 alaskensis 197
 ruficoxis 197
Lissonota sulferifera ruficoxis 197
Lissonotini 194
Litorina (Tectarius) atyphus 553
 (*Tectarius*) *galapagensis* 553
Lithophagus aristatus 551
Littorinidæ 553
Loxosceles longipalpis 55, 71
Lucinidæ 551
Lucidia bellonæ 522
 columbiæ 522
Lutricola cognata 551, 556
Lycosa albemarlensis 65, 79
 galapagoensis 64, 79
 snodgrassi 65, 79
Lycosidæ 64
Lyda credita 254
 marginiventris 254
 nigropectus 254
Lydidæ 254
Lygocerus 140
 alaskensis 140

Machilis arctica 103
Macrodyctium 252
 politum 252
Macrophya 261
 oregona 261
 pachyprotasis omega 260
Macrotonia celer 97
 ferruginosa 97
 flavescens 97
 lepida 97
 nigra 97
Macrura 285
 and *Brachyura* by M. J. Rathbun 275

Maidæ 283
Mallophaga from birds by V. L. Kellogg
 and S. I. Kuwana 457
 from birds, hosts 489
Marginella varia 555
Marginellidæ 555
Marine Mollusca, by H. A. Pilsbry and E.
 G. Vanatta 549
Marptusa californica 66
Meesea tschutschica 315, 346
 uliginosa 315
Meeseaceæ 315
Megaspilinæ 140
Melanichneumon 155
 seldoviae 155
Mellita stokesii 527
Members, list of, 26
Menopon 485
 albemarlæi 488
 galapagensis 487
 incertum 488
 narboroughi 485
 singularis 485
 snodgrassi 486
Mesochorini 238
Mesochorus 238
 frontalis 239
 kincaidi 238
 orcæ 239
Mesoleius 223
 aleutianus 224
 canadensis 215
 stejnegeri 223
Mesoleptini 204
Mesoleptus 210
 concolor 211
 unalaskæ 210
Metacelus 233
 lævis 233
Metridiina 394
Metridium 395
 dianthus 395
Micranous diamesus 509
Microcryptus 184
 alaskensis 184
 trifasciatus 184
Microgasterina 247
Micropanope polita 281
Microphrys branchialis 285
 platysoma 285
Microplectron 210
 alaskensis 210
Microplitis 249
 alaskensis 249
Mimesa 133
 propinqua 133
Miscogasteridæ 144
Misumena inclusa 62, 78
Mithrax bellii 284
 nodosus 284
 ursus 284
Mitra lens 555
Mitridæ 555
Mitrlaria varia 553
Mniaceæ 323
Mnium affine 323
 affine elatum 323
 cinclidioides 325
 glabrescens 324
 insigne 324, 346
 medium 323

- Mnium (Continued).
 nudum 324, 346
 punctatum 324
 punctatum anceps 324
 punctatum elatum 324
 rugicum 323
 spinulosum 324
 subglobosum 325
 Modulidæ 553
 Modulus cerodes 553
 Mollusca, marine, by H. A. Pilsbry and E. G. Vanatta, 549
 Monoblastus 213
 niger 213
 Monoceros grande 554
 Monopladnus 255
 insularis 255
 Mosses of Alaska, by J. Cardot and I. Thériot, 293
 Murex dipsacus 554
 princeps 554
 Muricidæ 554
 Myrmica 135
 lævinodis 135
 sabuleti lobifrons 135
 sulcinoides 135
 Myrmicidæ 135
 Mytilidæ 551
 Mytilus multififormis 551
 Myurella julacea 331
 julacea scabrifolia 331
 Nassa angulifera 554
 Nassidæ 554
 Naticidæ 552
 Neanura gigantea 88
 ornata 89
 Neckera douglassi 331
 menziesii 331
 pennata 331
 Neckeraceæ 331
 Nematidæ 256
 Nematinae 256
 Nematus 257
 crassus 257
 longicornis 257
 ocreatus 256
 pleuricus 256
 Nesotriccus 517
 ridgwayi 518
 Neuroteles 228
 americana 232
 dubiosus 228
 liriodendri 232
 Nidorellia armata 523
 Nirmus 467
 curvilineatus 470
 galapagensis 471
 gloriosus 458, 467
 lepidus 473
 obtusus 468
 paludicola 469
 separatus 472
 vulgatus 458, 474
 vulgatus galapagensis 474
 interpositus 475
 Ocypode gaudichaudii 275
 Ocypodidæ 275
 Odo insularis 64, 79
 galapagoensis 64
 Odontomerus 202
 mellipes 202
 Odynerus 134
 albophaleratus 134
 Officers 22
 Olesicampa 235
 alaskensis 235
 Oligotrichum aligerum 327
 hercynicum latifolium 327
 integrifolium 327, 346
 Olios galapagoensis 63, 78
 Olividæ 555
 Olivella gracilis 555
 Omalus 135
 sinuosus 135
 Onchidiidæ 556
 Onchidium lesliei 556
 Onychoteuthidæ 556
 Ophiocoma æthiops 525
 Ophion 233
 bilineatus 233
 bilineatus 233
 lateralis 233
 purgatus 233
 Ophionereis albomaculata 524
 annulata 525
 nuda 525
 Ophioninæ 233
 Ophionini 233
 Ophiotrix magnifica 526
 spiculata 525
 Ophiura teres 524
 Ophiuroidea 524
 Opiniæ 251
 Opisthobranchiata 555
 Oreoweisia serrulata 295
 Orthocentrus 231
 californicus 230
 nigritus 231
 Orthocentrinæ 226
 Orthothecium chryseum 332
 intricatum 332, 346
 Orthotrichaceæ 309
 Orthotrichum arcticum 310, 346
 fenestratum 310
 pulchellum 311
 speciosum 311
 Ostrea mexicana 550
 rosacea 550
 Ostreidæ 550
 Pachygrapsus crassipes 278
 transversus 279
 Pachynematus 256
 affinis 256
 gotarus 257
 ocreatus 256
 orarius 257
 oronus 256
 pleuricus 256
 Pachyprotasis 260
 nigrofasciata 260
 omega 260
 Palæmon 291
 Palæmonidæ 291
 Palinuridæ 287
 Paludella squarrosa 315
 Pamphilius marginiventris 254
 nigropectus 254
 Paniscini 237

- Paniscus 237
 alaskensis 237
Panopeus tanneri 281
Panulirus penicillatus 287
Papirius palmatus 102
Parapenæus kishinouyei 288
Paraselandria 255
 rufigastra 255
Passalococcus 133
 cuspidatus 133
 Patrons, list of 26
Paulia horrida 523
Pecten magnificus 550
Pectenidæ 550
Pelecanus aquila 516
Pelecypoda 550
Pemphredonidæ 133
Penæidæ 287
Penæus brevirostris 287
 californiensis 287
 canaliculatus 287
Pentaceros occidentalis 523
Perna chemnitziana 550
Pernidæ 550
Petricola amygdalina 551
Petricolidæ 551
Pezomachini 190
Pezomachus 192
 alaskensis 193
 nigrellus 192
 obesus 193
Pezotettix 448
Phædroctonus 235
 minutus 235
Phænosemus 231
 stikensis 231
Phæogenini 161
Pharia pyramidata 523
Phataria unifascialis 523
Philæus pacificus 67, 79
Philonotis capillaris 315, 346
 fontana 314
 fontana cæspitosa 315
 macounii 314, 346
 seriata 315
 vancouveriensis 315
Philonygus 189
 alaskensis 189
 glacialis 189
Pholcidæ 56
Phrynida 67
Phthorina 225
 borealis 225
Phygadenon 203
 californicus 177
 crassipes 177
 vulgaris 177
Phygadeuonini 170
Physostomum angulatum 483
Phytodietus 195
 clypearius 195
 flavifrons 196
Phytophaga 253
Pilsbry, H. A., marine mollusca 549
Pilumnidæ 279
Pilumnoides pusillus 281
Pilumnus spinulifer 281
Pimpla 200
 yakutatensis 200
Pimpla yukonensis 202
Pimplinæ 194
Pimplini 199
Pimplopterus 197
 alaskensis 198
 yakutatensis 197
Placunanomia foliata 550
Plagiothecium curvifolium 337
 denticulatum 337
 denticulatum donii 337
 denticulatum recurvum 337
 denticulatum undulatum 337
 elegans 337, 346
 fallax 336
 muehlenbeckii 337, 346
 pulchellum 337
 roeseanum 337, 346
 ruthei 337
 sylvaticum 337, 346
 undulatum 336
Planaxidæ 553
Planaxis planicostatus 553
Planes minutus 278
Platylabus 160
 californicus 161
 incabus 160
Platypodia gemmata 279
Plectiscini 240
Plectiscus 240
 orcæ 240
Plectocryptus 182
 popofensis 183
 yakutatensis 183
Plesiognathus 184
 rubrocinctus 184
Pleurechinus bothryoides 527
Pleurotomidæ 555
Plexippus paykulli 66
Podocheila margaritaria 283
Podura annulata 94
 arborea 94
 finetaria 92
 plumbea 93
 terrestris alba 92
 viridis 93
Pœcilochoera bifasciata 57
Pœcilocostomidea 256
 maculata 256
 maculatus 256
Pogonatum alpinum 328
 alpinum arcticum 329
 alpinum brevifolium 329
 alpinum macounii 328
 alpinum septentrionale 329
 alpinum simplex 329
 atrovirens 329
 capillare dentatum 327
 contortum 327
 dentatum 327
 erythrodontium 327
 macounii 328
 microdontium 329
 urnigerum 328
Polinices uber 552
Polyblastus 213
 glacialis 213
Polyplacophora 552
Polyterus 217
 sexcarinatus 217
Polytrichaceæ 325
Polytrichum behringianum 330
 boreale 330
 commune 329

Polytrichum (Continued).

- dentatum* 327
- formosum* 329
- gracile* 329
- hyperboreum* 330
- juniperinum* 330
- piliferum* 330
- sexangulare* 330
- strictum* 330
- yukonense* 329
- Pompilidæ 134
- Pompilinae 134
- Pontania 258
 - glinka* 259
 - islandica* 258
 - kukakiana* 259
 - ora* 258
 - peninsularis* 258
 - popofiana* 258
 - tundra* 258
 - unga* 258
- Porizonini 239
- Portunidæ 282
- Portunus (achelous) angustus 282
- (achelous) stanfordi 282
- Pottia helmii beringiana 301
- Pottiaceæ 301
- Praon 243
 - alaskensis* 243
- Pristiphora 257
 - anaka* 257
 - bucoda* 257
 - circularis* 257
 - kæbele* 258
 - lena* 258
 - ortinga* 257
- Probolus 160
 - subdentatus* 160
- Proctotrypes 136
 - nigripes* 136
- Proctotrypidæ 136
- Proctotrypoidea 136
- Promethes 224
 - unicinctus* 224
- Prothesima galapagoensis 57
- Protapanteles 247
 - alaskensis* 247
 - alticola* 248
 - glacialis* 248
- Pseudibacus pfefferi 285
- Pseudocallitergon* 343
- Pseudoleskea atrovirens 332, 346
 - radicosa* 332
 - rigescens* 332
 - stenophylla* 332, 346
- Pseudoscorpionida 68
- Psilopilum arcticum 327
- Psithyridæ 130
- Psithyrus 130
 - insularis* 130
 - interruptus* 130
 - kodiakensis* 130
- Pteromalidæ 145
- Pteromalinae 145
- Pteronius 259
 - rivularis* 259
 - shumagensis* 259
 - zebratus* 259
- Pterygophyllum lucens 331, 346
- Publication—Rules respecting 9
- Pulmonata 556

- Purpura columellaris 554
 - melones* 554
 - patula* 554
 - planospira* 554

Rathbun, M. J., Brachyura and Macrura 275

Reports—

- Auditing Com. 17
- Secretaries 11, 12, 14
- Treasurers 16, 18, 19, 20
- Rhabdoweisia fugax 295, 346
- fugax subdenticulata 295
- Rhacomitrium aciculare 307
 - canescens* 309
 - canescens ericoides* 309
 - cyclodictyon* 308
 - fasciculare* 307
 - fasciculare haplocladon* 307
 - heterostichum* 308
 - heterostichum affine* 308
 - lanuginosum* 308
 - microcarpum palmeri* 307
 - nevi* 307
 - palmeri* 307
 - patens* 307
 - sudeticum alaskanum* 307
 - tenuinerve* 307
- Rhineura floridana, Eyes of, by C. H. Eigenmann 533
- bibliography 549
- Rhizarcha 242
 - harringtoni* 242
- Rhogadinæ 252
- Rhogadinii 253
- Rhogas 253
 - harrimani* 252
- Rhynchopygus pacificus 527
- Rhynchostegium serrulatum 336, 346
- subdemptum 336
- Rhyssa 199
 - alaskensis* 199
- Rissoïdæ 553
- Rissoina fortis 553
- inca 553
- Sagartiidæ 394
- Schistocerca, Sphingonotus and Halmenus, by R. E. Snodgrass 411
- Schistocerca 412
 - intermedia* 431
 - intermedia borealis* 414, 435
 - intermedia intermedia* 414
 - literosa* 412, 415, 425
 - literosa discoidalis* 414, 425
 - literosa hyalina* 414, 427
 - literosa punctata* 414, 428
 - melanocera* 412, 415, 419, 423, 424, 425
 - melanocera immaculata* 414, 423
 - melanocera lineata* 413, 423
 - melanocera melanocera* 413
 - melanocera minor* 413, 421
 - melanocera pallida* 413, 422
- Scleropodium cespitosum 335
- colpophyllum 335
- illecebrum 335
- krausei 335
- Scolopax incana 511
- Scorpionida 68
- Scorpiorus 214

- Scorpiorus (Continued).
 alaskensis 214
 niveicola 214
 Scyllaridae 285
 Scytodidae 55
 Secretary's reports 11, 12, 14
 Selandriidae 255
 Salandriinae 255
 Selenops galapagoensis 63
 Seligeriaceae 300
 Semele punctata 551
 solida 551
 Semelidae 531
 Sicaroides ultriformis 55, 71
 Sirex 253
 flavicornis 253
 Siricidae 253
 Siricoidea 253
 Snodgrass, R. E., birds of Clipperton and
 Cocos islands 501
 Field notes on Arachnida 49
 Schistocerca, Sphingonotus and Hal-
 menus 411
 Solpugida 69
 Spanoctecus 204
 flavopictus 204
 Sparassidae 63
 Sphecoidea 131
 Sphingonotus 436
 fusco-irroratus 411, 437
 tetranesiotes 437, 438, 444
 tetranesiotes barringtonensis 437,
 445
 tetranesiotes charlesensis 437, 444
 tetranesiotes hoodensis 438, 446
 tetranesiotes indefatigabilensis 438,
 447
 trinesiotes 437, 438, 439
 trinesiotes albemarlensis 437, 443
 trinesiotes chathamensis 437, 439
 trinesiotes indefatigabilensis 437,
 441
 Spilomicrus 140
 alaskensis 140
 Spinolia 186
 minuta 186
 Splachnaceae 312
 Splachnum luteum 312, 346
 sphaericum 312
 vasculosum 312
 wormskjoldii 312
 Stenichneumon 148
 unalaskæ 148
 Stenomærus 232
 borealis 232
 Stenorynchus debilis 283
 Sterna candida 511
 fuliginosa 505
 Stibeutes 170
 nigrita 170
 Stiboscopus 170
 alaskensis 171
 ferrugineus 173
 mandibularis 172
 sanctipauli 171
 sitkensis 172
 solitarius 172
 Stilpnini 162
 Strongylocentrotus gibbosus 526
 tuberculatus 527
 Strongylogasterinae 260
 Stylifer astericola 552
 Sula brewsteri 513, 514
 cyanops 512
 nesiotes 514
 piscator 515
 piscatrix websteri 515
 websteri 515
 Sychnoportus 216
 longitarsis 216
 Synalpheus neptunus 289
 Synopius 226
 brevipennis 226
 pleuralis 227
 Tapinops 230
 abdominalis 230
 emerginatus 230
 pusillus 230
 Tyloria serrata 312
 tenuis 312, 346
 Tealidae 390
 Tectarius galapagiensis 553
 Tegenaria derhami 58
 Teleophrys cristulipes 284
 Tellinidae 551
 Tenthredinidae 259
 Tenthrediniinae 260
 Tenthredinoidea 254
 Tenthredo 261
 auraria 261
 bivittata 262
 dissimulans 262
 erythromera 262
 evansii 261
 femorata 263
 ferrugineipes 261
 flavomarginis 262
 harrimanii 262
 lineata 261
 melanosoma 262
 nigricollis 262
 nigrofasciata 260
 semicomis 262
 varipicta 261
 Tenthredopsis evansii 261
 Terebra larvæformis 555
 Terebridae 555
 Terobia 144
 vulgaris 144
 Tetragnatha galapagoensis 61, 78
 Tetraphidaceae 311
 Tetraphis geniculata 311
 pellucida 311
 Tetraplodon mnioides 312
 mnioides cavifolius 312
 urceolatus 312
 Tetrarhapta 141
 alaskensis 141
 Tetrastichinae 146
 Tetrastichus 146
 alaskensis 146
 anthracinus 146
 Thaumatotypus 190
 alaskensis 190
 Theridiidae 59
 Theridium 59
 carolinum 50, 59
 mixtum, 59, 72
 Thériot, I., Mosses of Alaska, 293
 Theroscopus 191
 kukakensis 191

- Theroscopus* (Continued).
 popofensis 192
 rufipes 191
Thestis 187
 tricincta 187
Thomisiidae 62
Thomisoides ultriformis 55
Thuidiaceæ 332
Thuidium abietinum 333
Thyreopinae 132
Thyreopus 132
 succinctus 132
 vicinus 132
Timmia austriaca 325
Tlemon 216
 delicatus 216
Tmarus stolzmanni 62, 78
Tomocerus americanus 101
 arcticus 100
 celer 97
 flavescens 97
 lepida 97
 niger 97
 niger americanus 101
 niger arcticus 100
Torrey, H. B., Anemones of Alaska 373
Torymidae 143
Torymus 143
 cecidomyia 143
Toxopneustes semituberculatus 526
Treasurer's reports 16, 18, 19, 20
Trematopygus 215
 kukakensis 215
Tremex flavicornis 253
Trevoria 196
 yakutatensis 196
Trichiosoma 263
 aleutianum 263
 triangulum 263
 triangulum aleutianum 263
Trichostomum cuspidatissimum 302
 sitkanum 303
Triclistus 232
 curvator 232
Tridyminae 144
Tritonidea sanguinolenta 555
Trivia galapagensis 554
 maugeriæ 553
 pacifica 554
Trochidae 552
Trophoctonus 215
 insularis 215
Tryphon 215
 alaskensis 215
 canadensis 215
Tryphoninae 204
Tryphonini 215
Tyroglyphidae 70
Tyroglyphus 70, 80

Uca galapagensis 275
 helleri 277

Ulota alaskana 309
 barclayi 310
 crispa subcalvescens 310
 drummondii 309
 phyllantha 309
Urocerus flavicornis 253
Urticina 390
 crassicornis 391

Vanatta, E. G., marine mollusca 549
Venericardia flammea 551
Veneridae 551
Venus multicostata 551
 succincta 551
 tricolor 551
Vespa 134
 arenaria 134
 borealis 134
 marginata 134
Vespidæ 134
Vespinæ 134
Vespoidea 134

Webera albicans 317
 albicans glacialis 317
 annotina 317, 346
 cruda 315
 crudoides 317
 cucullata 316
 cucullatiformis 317
 drummondii 317
 nutans 315
 nutans bicolor 316
 nutans cæspitosa 316
 nutans strangulata 316
 polymorpha 317
 proligera 317
 pseudogracilis 316
Weisiaceæ 294

Xanthias politus 281
Xestophya 162
 nigripes 163
 polita 162
Xoridini 202
Xylonomus 204
 frigidus 204

Zachresta 234
 kukakensis 235
 popofensis 234
Zelotypa 137
 alaskensis 139
 borealis 138
 scutellata 137
Zootrepes 225
 insularis 225
Zygota 139
 americana 139

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